BULLETIN OF THE

TAYLOR SOCIETY

A SOCIETY TO PROMOTE THE SCIENCE AND THE
ART OF ADMINISTRATION AND OF MANAGEMENT

IT is certain that there are a great many articles of every day use in which the manufacturer would indeed be glad to undertake some cooperation in standardization, from which the saving in national effort would be interpreted not into millions but into billions of dollars. This does not mean that we stamp the individuality out of manufacture or invention or decoration; it means basic sizes to common and every day things—*Herbert Hoover.*

APR
27
1921

Hohokus, N. J.
and
Engineering Societies Building
29 W. Thirty-Ninth St.,
New York

APRIL, 1921 VOL. VI., No. 2

TAYLOR SOCIETY

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29 WEST THIRTY-NINTH STREET, NEW YORK

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(Extract from the Constitution)

The objects of this Society are, through research, discussion, publication and other appropriate means:

1. To secure an understanding and intelligent direction of the principles governing organized effort for the accomplishment of industrial and other social purposes for the mutual benefit of

   A. The Community
   B. Labor
   C. The Manager
   D. The Employer

2. To secure the gradual elimination of unnecessary effort and of unduly burdensome toil in the accomplishment of the work of the world.

3. To promote the scientific study and teaching of the principles governing organized effort, and of the mechanisms of their adaptation and application under varying and changing conditions.

4. To promote general recognition of the fact that the evaluation and application of these principles and mechanisms are the mutual concern of the community, labor, the manager and the employer.

5. To inspire in labor, manager and employer a constant adherence to the highest ethical conception of their individual and collective social responsibility.

APR 27 1921

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TAYLOR SOCIETY
A SOCIETY TO PROMOTE THE SCIENCE AND THE ART OF ADMINISTRATION AND OF MANAGEMENT

Published at Hohokus, New Jersey
and
Engineering Societies Building
29 West Thirty-ninth Street, New York

All communications should be sent to the latter address

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This Issue 75c
Application for entry as second-class matter is pending.

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COMMENT

IN this issue is concluded the publication of the papers and discussions of the meeting of Dec. 3, 1920. The discussion of the reports of the sales executives' committees is not included. The reports themselves were published in Vol. V, No. 6, in advance of the meeting, and the discussion as it appears in the stenographer's transcript presents to such an extent the form of running questions and answers—like transcript of court testimony—as to be practically impossible of condensation and editing.

WE believe that the three papers on standardization of product will be read with great interest; they supplement each the other and together constitute as satisfactory a general presentation of the subject as we have seen. The idea of standardization of product from the point of view of shop management is fundamental in scientific management; the idea is not new to executives who have given thought to scientific sales management and the coordination of sales and production—see Vol. V, Nos. 5 and 6. A few executives who, during the past year or two, have been concerned with the development of methods of settling labor disputes within certain trades, have come to the conclusion that the establishment of rate standards throughout a trade is dependent upon the development of clearly defined standards of products and parts. The idea of standardization of product, therefore, is not new.

BUT not many executives have given thought to the problem as a trade or a national industrial problem. The work of the Conservation Division of the War Industries Board was known to many executives, of course, but under the circumstances as an emergency—and distracting—war measure. Few gave thought to the applicability of the principles in normal times. It is to be regretted that the complete story of the work of the Board has not been made available to the public. The story of detail achievements would have, we believe, great educational value. The industrial problem of the day is increased and less costly qualitative production;—to restore, from the point of view of national economy, the wastes of war; to make possible, from the point of view of the individual plant, reduced production costs without "taking it out of the worker" by compelling a reduction of his income, and therefore of his standard of living, to what it was before the war. We know it will not be taken out of the consumer by the maintenance of high prices; the machinery of a "consumers' strike" gets slowly into action, but once in action, it works with exceeding effectiveness. We know how—although not all executives avail themselves of that knowledge—to reduce costs through better plant organization and processing, and to a limited extent through better selling; but we have yet to learn how to reduce costs through better cooperative organization, processing and selling. Granted the will to cooperate in a trade, that way out lies a broad highway of incalculable possibilities.

THE addresses seem to agree that the cooperative effort should not be through the machinery of government. (Take the government out of business!) Therefore it must be through voluntary trade agreements. A word of warning: if the trades do not take action, in time the governments may. In nearly all instances such action by the state is due to the failure of individuals to take action through such associations as are represented by the trades. That is the why of interstate and state commerce commissions; of trade commissions; of pure food laws. If the trades do not voluntarily create regulative organizations, the governments will. While it may be a long time before the consuming public perceives the advantages of standardization of product (to the extent possible without destroying individuality), the time will come. Mr. Hoover's committee on the investigation of waste may be a sign pointing to the time. The executives of production should beat the consuming public to it. Mr. Smith's paper gives seven good reasons why important trade economies—and therefore national economies—will be effected by trade standardization of products and parts, without destroying individuality and the opportunity for wholesome competition within the trade.

MR. HOOVER'S address before the American Engineering Council is worthy of permanent record in the BULLETIN; especially in this issue because of what it says about standardization. The quotation from that article on our front cover sums up in the fewest possible words the argument in favor of standardization—savings in national effort—and answers the principal argument against standardization—it need not stamp out of manufacture either individuality or invention or decoration. It is to be hoped that so strong a body as the Federated American Engineering Societies, with all the vigor that such leadership as Mr. Hoover's can give it, and in cooperation with other influential organizations such as the Chamber of Commerce of the United States, will begin a campaign of education on behalf of standardization which will not cease until it is taken up by every trade association in the United States. There is a war to be paid for and but one way to secure the funds,—savings by more economical national effort.

THE address, "Risk—A Retarding Factor in Production," made a profound impression on the audience, notwithstanding Professor Friday's own appraisal of his suggested remedy as bizarre. It is doubtful whether a single person in the audience thought the remedy practicable or desirable. Yet one engineer in discussion said, "I should like to say I have never in my life heard a paper on fixing things in this country which has made the impression on me which this paper has made. I think it is the biggest thought detonator this Society has ever had." Why should a group of practical engineers and executives be so interested in an economist's discussion of a general economic problem, an impossible thing ten, even five, years ago? Because they have come to realize that economic problems are practical problems of management. They have come to realize that the development and especially the maintenance of scientific management in the plant would be promoted were some of the obstacles imposed by the general economic machinery of society removed. The executives of a plant and a consulting management engineer spend one or two years on developmental work, and considerable money, and begin to see measurable results, when along comes some disturbing influence out of the general economic situation and nullifies all their efforts. So some engineers and executives are beginning to think about general economic problems and consider whether they can be attacked in an engineering fashion; whether some of these obstacles to their work may not be eliminated. That is why his hearers listened with such keen interest to Professor Friday's analysis and proposed remedy; why they listened with similar interest to Professor Fisher's address, "How An Unstabilized Dollar Interferes With Efficient Management," at the Springfield meeting (the address will appear in the June issue); why the Taylor Society is introducing into each of its meetings one address on such general economic problems.

IT is with deep regret that we announce the death, suddenly, March 2 at St. Petersburg, Florida, of Miss Frances Mitchell, Mr. Taylor's secretary for many years, and later Secretary at Boxly for the Frederick W. Taylor Co-operators and the Taylor Society.

Her loss will be greatly felt in connection with work now in progress, especially in her devoted interest to many details involved in the publication of Mr. Taylor's biography.

A part of the power that grows out of the Scientific Management movement is attributable to the fact that it inspires on the part of the individual worker in all grades willing unselfish service.

LOUISE M. S. TAYLOR
CARL G. BARTH
MORRIS L. COOKE
H. K. HATHAWAY

STANDARDIZATION OF PRODUCTS[1]

1. AS A NATIONAL ECONOMY

By Melvin T. Copeland[2]

WHEN the armistice was signed in 1918, the Conservation Division of the War Industries Board had prepared conservation programs for two hundred sixty-nine industries. In undertaking to discuss standardization of products as a national economy, I assume that I am expected to present some of the results accomplished through these conservation plans and to point out my general conclusions regarding the applicability of such measures to business management during times of peace. In so far as these plans resulted in standardization, it was standardization of the products of an entire industry. Incidentally it involved some degree of standardization in numerous individual plants. In many other cases, however, a single plant previously had carried standardization much further than could be done by the industry as a whole. A manufacturer of men's shoes, for example, might operate his factory entirely on a single grade of product in one or two styles. Such a restricted range of output obviously would not be sufficient for the entire industry even though the policy of standardization was sound for the individual plant. My discussion consequently will deal chiefly with industrial standardization, not with plant standardization.

The task of the Conservation Division was to bring about a husbanding of the resources and production facilities of the country "by means of scientific, commercial, and industrial economies." The chief methods of conservation employed by the Division, in so far as they related to standardization of products, may be summarized in general terms briefly as follows:

1. A maximum reduction in the number of styles and varieties, sizes, colors, and finishes of the product of an industry.

2. The elimination of styles and varieties that required more than the strictly necessary amount of material.

3. The elimination of features or accessories that used material for adornment or convenience which were not actually essential to the serviceability or utility of the product.

4. The elimination of patterns and types of products that were less essential to the civilian population.

5. The standardization of sizes, lengths, widths, thicknesses, weights, gauges, etc., of materials, parts and sections of a product by means of which strength and durability could be obtained with the employment of a minimum quantity of material and labor in manufacturing and with a reduction in the quantity of material, (parts and finished product) carried in stocks.

Although the Conservation Division did bring about a degree of standardization, this was accomplished by a process of elimination. We took each industry as we found it, and with the help of the business men themselves determined the styles, types and sizes of the products that could be discontinued without unfair injury to producers and without serious sacrifice to consumers. This policy for securing conservation was diametrically opposed to the one that was followed in most European countries. The English government, for example, introduced a standard shoe and standard clothing primarily as a means of price control. Starting with one standard product, the government found it necessary to permit more and more variations constantly increasing the style range of the standardized article. Manufacturers were not compelled to restrict their output to the standard product. Although the effect of the regulations in England was to cut down the output of articles that did not conform to the standard, nevertheless some manufacturers continued to produce a wide variety of styles. According to the American schedule of conservation, on the other hand, all manufacturers confined their output of shoes, for instance, to white, black, and tan, limited the height, and eliminated features that were wasteful of material. The various colors of leathers and fabrics to be used were standardized, and the introduction of new lasts stopped. This American program, which was carried out by the entire industry, guaranteed the maximum economy with a minimum of disturbance to the conditions and methods of production and market distribution.

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[1] Papers presented at the annual meeting of the Taylor Society, New York, Dec. 4, 1920.

[2] Director Bureau of Business Research, Harvard University; formerly Secretary of Conservation Division, War Industries Board.

I believe that I can best indicate the results accomplished by the conservation programs in this country by giving a few specific examples. In the manufacture of men's hats, for instance, the conservation program reduced the number of colors to be used to nine; several manufacturers previously had lines of hats in approximately one hundred colors. In the hat trade several features also were eliminated in order to save materials. In the felt shoe industry the product was restricted to four colors and four styles. Up to the time that this schedule went into effect, a single manufacturer often had a line including one hundred colors and a wide variety of styles. It was estimated that this program would yield an annual saving of fifteen per cent in the quantity of materials used in this industry.

The number of colors of book cloth was reduced fifty per cent and the length and width of the rolls was standardized. In the harness and saddlery business eighty-eight per cent of the styles and varieties of products were eliminated. Trunks of the ordinary sort were reduced to three sizes, and wardrobe trunks also were restricted to three sizes. All trunks manufactured under this schedule were limited to forty inches in extreme measurement, in order to permit the best utilization of transportation equipment. Trunks longer than forty inches are wasteful of space in baggage cars.

The rubber footwear manufacturers in their conservation schedule provided for the elimination of 5,500 styles and for economy in the packing and shipping of their product. The estimated annual saving from the observance of the conservation program in this business was 29,012,000 cartons, 30,380 gallons of varnish, and also heavy savings in other materials and in shipping and storage space.

The agricultural implements industry was one that afforded unusual opportunities for conservation. Typical schedules for the agricultural implement industry provided that the number of sizes and types of steel plows be reduced from 312 to 76, of planters and drills from 784 to 29, of disk harrows from 589 to 38, of buggy springs from over 120 to 1. Similar opportunities for economy were found throughout the agricultural implement business. One implement manufacturer, by making his production of farm wagons conform to the conservation schedule, reduced the variety of front and rear gears manufactured in his plant from 1,736 to 16. Under this restricted schedule the needs of the farmers were as well provided for as in the past. No really essential sizes or types of product were eliminated; yet large savings were realized by the implement manufacturers through the simplification of their operations.

In the pocket-knife industry the number of basic patterns was reduced from over 300 to 45, and the catalogue numbers from 6,000 to not more than 100 for each manufacturer. Similar conservation schedules were prepared for other hardware products, although many of them had not gone into effect when the armistice was signed. One hardware wholesaler previously had more than 90,000 items listed in his catalogue. He estimated that if all these conservation programs had taken effect, the number of items in his catalogue would have been reduced one-half.

In the stamped metal ware industry, manufacturing enamel ware goods, tin ware, and galvanized ware, 4,252 items were eliminated, with an eighty per cent reduction. In china ware one manufacturer cut his line from 1,696 items to 330. In the metal bedstead industry the program of elimination and standardization of product meant a saving of about thirty-three and a third per cent in the quantity of steel used, and one manufacturer stated that under this plan he could turn out ninety per cent of his normal product with seventy-five per cent of his normal supply of labor.

These examples are typical of many other industries with which the Conservation Division dealt. Although the estimated savings in some instances may seem to be large, our experience during the war showed that in practically every case in which the program was in effect long enough for a test, the savings actually were greater than the first estimates. In their ramifications the conservation schedules effected small savings that were not anticipated or foreseen.

Through this standardization of products, manufacturing operations were simplified. In filling the orders from farm implement manufacturers, for instance, under the conservation schedule the steel mills found it necessary to change their rolls less frequently than in the past. They could secure longer runs on a small variety of sizes. Inasmuch as it ordinarily is a five or six hours' job to change rolls in a steel mill this saving was appreciable.

Economies in plant operation were realized in the various stages of manufacture. This standardization of products reduced the quantity of raw materials used and lessened the quantity that it was necessary to carry in stock; the smaller the variety of product turned out, obviously the fewer kinds and varieties of raw materials that must be kept on hand. The standardization programs made possible a reduction in the stocks of parts of finished products to be carried by manufacturers, and by retailers. The reduction in the number of sizes and types of automobile tires from 287 to 9, for example, obviously enabled retail dealers to operate with smaller stock. This lessened the amount of capital that had to be tied up in a business and in time it would have helped to reduce the losses from depreciation.

In working out these plans, all manufacturers and merchants who were interested were given an opportunity to take part in the formulation of each program in order that their interests might properly be safeguarded. I may add that the thousands of manufacturers and merchants with whom we had to deal showed a hearty spirit of cooperation. Occasionally the standardization of products involved real hardship. In a majority of instances, however, when the circumstances were explained to them, the manufacturers and merchants themselves were glad to be rid of most of the styles, varieties, and sizes of products that were eliminated. In every trade wasteful practices had crept in which it was mutually advantageous to stop.

The reasons for the existence of these wasteful practices were much the same in the various trades. In some cases the production of certain styles or types of product was due to the idiosyncrasies of a single manufacturer. One trunk manufacturer, for example, produced an odd-size trunk which he insisted was of peculiar merit, but we could not find anyone who would agree with him. In other trades the great variety of products was due in part to provincialisms in demand, such as the yokel trade in clothing which called for gaudy styles of peg-top trousers, diamond shaped lapels, and other folderols. Some varieties of farm wagons were produced by numerous manufacturers because of the persistence of a demand among the farmers in certain localities who were reluctant to have a farm wagon different from the sort that they had used in the past. The left-hand plow is another illustration of a provincialism in demand, many farmers having an unfounded belief that a left-hand plow has some peculiar merit not possessed by a plow that turns the furrow to the right. It was but natural for manufacturers and merchants to cater to the whims of demand.

In several trades the variety of products was due to technical progress whereby new sizes and types had come into use, while the demand for the previous sizes and types continued on a small scale. This was particularly true in the case of such articles as automobile tires and electrical appliances.

The chief reason for the multiplicity of styles, varieties and sizes, however, was competition. The excessive variety originated far more commonly in the sales department than in the production department. We found numerous instances in which a manufacturer had introduced a new size of product merely in order to shade the price. The twenty-one-inch sewer pipe, for example, was first introduced by a manufacturer so that he could shade the price on a contract that nominally called for twenty-two-inch pipe. In other industries manufacturers had introduced variations in their products merely to create immaterial talking points or to provide an artificial stimulus to lagging sales. These innovations soon were copied by competitors and practically the whole trade continued to manufacture them. Thus barnacles accumulated of which the industry was not able to rid itself.

So much for the past. What is to be done in the future? In several industries, such as the farm wagon industry and the paint industry, the war-time conservation schedules have been continued in effect up to the present day with only slight modifications. One clothing manufacturer was led by his experience with the conservation measures of the war period to continue his search for new opportunities for economy, and by minor changes in designing he is making an additional saving of three per cent in the quantity of cloth used in each suit manufactured. While the saving on each suit is small, it will amount to an appreciable item for the business as a whole, and the trade is highly competitive. Although no canvass of various trades has been made, I have learned incidentally of numerous instances in which the conservation schedules still are being observed in whole or in part. Many manufacturers discovered such large savings from standardization that they have desired to have it continued.

As high a degree of industrial standardization obviously will not be practical in most industries in times of peace as during the war. The experiences of the last eighteen months, however, indicate that a somewhat modified program of conservation would be thoroughly advantageous. It is in the interest of national economy to avoid unessential multiplicity of styles, varieties, and sizes of products, in order that manufacturing processes may not be unnecessarily complicated and retarded, or labor, materials, and capital wasted. To be sure, any plan that is adopted should be sufficiently flexible to permit experiments and to allow readily for the introduction of new articles of merit. Otherwise, industrial progress would be severely handicapped. Nevertheless, it is to the interest of the public and to the interest of manfacturers and merchants that obsolescent products and immaterial variations in products should be scrapped as rapidly as possible. The real problem in regard to a comprehensive program of industrial conservation is how to have it brought about. Most business men will agree with the theory of the project. Many know from experience that is has resulted in large savings under war conditions. Nevertheless, it appears that we may drift back into the old state of affairs for want of practical machinery to secure the economies on which a large majority of manufacturers are agreed in principle. Although some individual manufacturers are following a far-sighted policy by refusing to yield to the temptation to follow their competitors in producing unessential styles and sizes of products, concerted action is necessary to secure the maximum savings.

The Federal government is naturally the first agency for consideration in formulating and carrying out a comprehensive program. Eventually it may be practical to have this work taken up again by the Federal government, but personally I am dubious about the prospects of gaining more than we lose by such a course. One thing is certain. It would be fatal to have any government bureau given mandatory power, even if it could be done constitutionally, to compel the observance of a standardization program in times of peace. Such mandatory power easily could strangle progress. The government agency almost certainly would move slowly, and I fear that not infrequently it might act arbitrarily. If it became a political issue, irreparable harm might be done to many businesses.

I am not at all optimistic that such plans could be worked out successfully by a department of the government acting even in an advisory capacity. There would be more or less of the bureaucracy that is so common in governmental activities, and under existing conditions I suspect that the machinery might become too expensive. At the present time it is so urgently necessary that government expenses be cut down that I, for one, should hesitate to approve a recommendation that the government spend additional funds even for so highly meritorious a purpose as that of industrial conservation. I am one of those old-fashioned Yankees who look with apprehension upon the tendency for so many business men, as well as would-be reformers, to turn immediately to the government for the paternalistic remedy for ills that beset them. In fact, instead of adding to our government services, I should suggest that perhaps a program of elimination might advantageously be applied to them.

Inasmuch as the benefits of industrial conservation or standardization will accrue in the first instance to the trade itself, the cost of the investigation and administration of the plan in each trade should be borne by that trade. It should be worked out on a comprehensive basis which would provide for a thoroughgoing investigation in manufacturing plants and a study of the problems from the standpoint of wholesalers, retailers, and consumers. This investigation should show specifically what savings have been effected by the conservation measures in each industry during the last three years. It also should develop the details of a program that can be applied in a practical way in the future, with provision for such modifications as will be necessary to protect new inventions and improvements and to insure progress. A large amount of good might be accomplished merely by the publication of the results of such a comprehensive study of the facts. Once the facts were ascertained, however, the task should be undertaken of securing the adoption and observance of whatever plan was proved to be practical. In many cases this work probably could best be done through national trade associations or similar agencies. There is also the possibility that the colleges and universities might take part in the work.

I do not agree with the view that industrial conservation can be accomplished only through the government. If government control were necessary, I should consider the whole project practically hopeless. To develop such a plan successfully it would be necessary that the business men in each trade work together harmoniously with a real spirit of give and take. Unless this spirit were present, the government would be able to accomplish little. If the morale of any trade is strong enough to work effectively with the government, I believe that it also can work just as effectively through its own association or with some other agency and avoid the dangers that are inherent in government interference. The problem is one for the business men themselves to solve. Something can be done by manufacturers acting individually. More can be accomplished if an entire industry will take hold of the job from the standpoint of broad general interest.

We need to recognize more clearly that the war losses of labor and material must be made good if our standard of living in America is to be maintained. Our most difficult problems are national problems, and their successful solution depends in large measure upon our taking a national point of view. Just as industrial conservation was one of the most effective means of meeting war conditions, I am satisfied that a development of similar plans by business men on their own initiative would be a particularly sound method for meeting the financial and industrial problems of the country during the next few years. The savings that might be made through a sound program of industrial conservation would cover a substantial portion of the burden of the annual charges on our war debt. The carrying out of such plans, moreover, would be merely an application of the labor-saving principles that have been fundamental to the success of American industry in the past—a tendency to concentrate on the production of standard articles in large quantities. The general adoption of such plans would strengthen American industry enormously in world competition. While it is true that it would necessitate some changes in our business habits and customs, this would be a small price for business men to pay for the national advantages that would be gained.

II. AS A TRADE ECONOMY

By Alfred L. Smith[1]

The motive for standardization is the desire on the part of operators of individual businesses to obtain an increase in profits. In general, they aim to achieve their ends by means of more efficient production in their plants. The immediate results of their efforts, if successful, are increased volume of production, improved quality of product and decreased unit cost.

The motive for and the aim and immediate results of standardization are intimately connected with individual plants only. It is not strange, then, that the matter of standardization should be generally—although I believe erroneously—looked upon as almost exclusively a plant problem.

Standardization is as much a trade as a plant problem. The individual manufacturer who endeavors to develop standardization in his plant will find himself unable to proceed very far—at least compared to the possibilities—without cooperation of some kind from the other elements of his trade; while any appreciable progress in standardization by important units in a trade cannot fail to have material effects upon the trade as a whole.

This mutuality of interest in standardization is not confined to concerns operating in the same branch of an industry or trade, but extends throughout an entire industry. In fact, progress in standardization by important individual units in any branch of an industry is more dependent on similar progress in those allied branches of the industry which are its suppliers of materials, or users of its products, than it is in other plants of the same branch, and the results are often reflected more definitely in allied branches of the industry.

Some of the reasons for this mutuality of interest throughout the trade, and its allied lines, become apparent on very little investigation. They are soon realized by anyone attempting standardization in an individual plant. A few of them may be mentioned, and will undoubtedly suggest many others.

Frequently standardization means such changes in the character of the product—usually of a minor nature actually, but seemingly radical—that the prejudice of the distributor or the ultimate consumer must be overcome. Seldom is an individual able to accomplish anything in such a matter. It requires the joint and interested efforts of an entire trade. Thus does the problem cease to be a plant matter. In fact, the allied trade which sells the product becomes vitally interested, not only in learning of the real nature and benefits to them of the standardization planned, but also in protecting themselves from such standardization as their experience shows would be unwise and in promoting such as is desirable. Thus the cooperation of an allied trade is secured. At the same time, the requirements for changes in character of materials create problems for the manufacturers of such materials, and another allied trade becomes an integral part of the movement. Finally, the finished product may be used in conjunction with an entirely distinct line of industry, which is materially affected, and therefore considers itself vitally interested.

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[1] General Manager, Music Industries Chamber of Commerce, New York.

Being a trade as well as a plant problem, any individual concern interested in obtaining the greatest possibilities of standardization in individual plants, should realize the necessity of creating an active interest in standardization throughout the trade. The national trade associations which exist in almost every field of industry offer a most promising means of realizing the benefits of standardization in its fullest sense by making possible maximum progress in individual plants, through cooperation. Any trade association ignores a wonderful opportunity to serve its industry if an adequate standardization program is not developed.

Standardization as a trade activity has been undertaken already by organized effort in a score or more industries, including gas, musical instruments, boxes, dyers and cleaners, rubber goods, metal lath, cooperage, bicycles, pumps, sand and gravel, meat packers, flour, automobiles and accessories, clothing, lumber, paint, shoes, petroleum, and railway equipment.

The work of standardization, as carried out by a trade association, is different in character from that undertaken in individual plants, which it supplements but in no way replaces. The standardization work of a trade association usually falls into three classes:

1. The work of interesting the members of the trade individually and collectively in the possibilities and benefits of standardization.

2. The work of determining along what general lines standardization is feasible in the trade, and stimulating the efforts of individuals along those lines.

Frequently this necessitates technical and commercial investigation of such a broad and fundamental character that the entire trade must participate.

3. Most important of all, that work which might be characterized as "standardizing standards" in individual plants and in allied trades.

For instance, it is natural for a manufacturer developing standardization to attempt to confine purchased materials to a limited number of types and sizes. A score of piano manufacturers might each standardize on one size of upright, but each require a back of different size, these backs varying only slightly from each other. With proper cooperation, they could easily and satisfactorily standardize on the same sizes of back. They might decide on a number of standard size backs; yet if they have not cooperated with the piano supply trade, they might find that the back manufacturers themselves had standardized on backs varying just enough from the standards of the piano manufacturers so that the latter would be special sizes. With proper cooperation the standard sizes of both piano and back manufacturers could be the same. Again, the piano manufacturers might standardize on five mahogany finishes, which if decided upon without cooperation with furniture manufacturers, might not coincide with any of the nine finishes standardized by the latter.

This lack of "standardizing standards" is not so simple as it sounds, for the human factor enters largely, and the conflicting interests, ideas and prejudices of competitors and of different trades must be harmonized.

There are at least seven especially important trade economies to be obtained by standardization:

1. *Decrease in capital investment in all branches of the trade, and in all individual plants.* This is especially true in those trades making products to specification. Economy is especially apparent in the inventories of tools, patterns and manufactured parts.

2. *Elimination of waste in experimentation and designing.* Much of the experimentation and designing in individual plants is made unnecessary when scientific investigation and tests have been made by the trade, for the benefit of all members.

3. *More speedy and reliable deliveries.* With standardization, the manufacturer is often able to carry stock available for quick delivery which he would not carry if he were not assured of a group demand for it, because of its standardized character. There is also more opportunity to divert production from one customer to another under stress of circumstances. During the recent period of materials shortage, the situation would have been greatly relieved in many trades if the materials requirements of its members had been standardized.

4. *General decrease in prices.* Lack of standardization in a trade makes it a specialty trade; and any specialty trade is distinctly a high priced trade. Not only are the prices high on the special orders themselves, but through indirect results, particularly overhead cost and a general tendency to slow up labor and machinery, they place production on a more expensive basis.

Following are summaries of statements on this point brought out during the discussions at the convention of the Musical Supply Association of America last May, from which the opinions to be quoted later are also taken:

"There are piano manufacturers with seven styles and sizes of cases, although they make less than 1,000 pianos a year. The manufacture of products under such conditions is the manufacture of specialties, and is more expensive than the production of a few standard sizes. The speaker makes 150 styles. If standard sizes could be brought down to a few, a conservative estimate of the saving would be ten per cent, a part of which would go to the manufacturer for his cooperation." Incidentally, this shows why standardization must be a cooperative trade matter rather than an individual plant problem.

"The speaker (a manufacturer of grand cases) has thirty-five forms........They could be decreased to five and make no material difference. . . . . . Such a standardization would mean less stock in process, and production would increase........probably as much as twenty per cent."

"The speaker spoke of an order for 75 special backs which decreased production in the plant from 100 to 125 per day to 75 in 1½ days, and at the same time necessitated changes in processes, resulted in annoyance to the entire organization, and extra pay. This shows the high cost of producing special supplies."

5. *The introduction of new processes and machinery facilitated and made possible.* This economy was brought out strikingly at the convention referred to above, when it was stated that piano plate makers are compelled to use so many patterns that it is not feasible to develop molding machines. Standardization would hasten the development of practical machine molding.

6. *Elimination of false and wasteful ideas prevalent in the trade, relative especially to design, quality and methods.*

"The manufacturer can profit by eliminating unnecessary styles, sizes and particularly 'ideas' in plates. Especially would it take 'freak plates' out of the trade."

"Standardization in plates would eliminate many annoying features. There is now a great amount of unnecessary lettering. This keeps in each plant one or two men to adjust letters, and frequently results in mistakes in lettering. Some of the ideas which manufacturers insist upon really result in a poorer plate. There is a great waste in making patterns. For instance, this concern made five patterns for a certain manufacturer, but never made a single plate from any of them."

"Saving in standardization from plate manufacture would be ten per cent, resulting particularly in the elimination of annoying features."

"At present, bars are often too heavy and panels too light. There is now an excessive variation between the 150-pound and the 300-pound plate. The latter plate is unnecessarily heavy."

"There is some saving in the amount of materials which have to be carried for useless features on plates."

7. *Decrease of ruinous competition due to ignorance.* Standardization means more dependable advance estimates of quality, cost, and time delivery. It automatically makes better cost systems possible, and more likely to be developed. The net result is elimination of uncertainty and ignorance which results in bids, quotations and promises which cannot be met by the reliable manufacturer.

No organized attempt to promote standardization in a trade should be undertaken without enlisting the active and intelligent support of the merchandising branches of the trade, particularly the retailers. One of the chief selling points of most articles is distinctiveness in some form or other. The merchandiser—and this applies to the advertising and selling departments of the manufacturer—instinctively opposes standardization through fear that it eliminates distinctive features. This fear exists in all trades, but more than commonly so in those selling highly manufactured articles, and especially those having characteristics of style, and in the field of the so-called "art industries." This fear is groundless, however, for real standardization will in the end give more opportunity for individuality in those ways which really promote the distinctiveness of the product, and at the same time will make a product of better quality at less cost. In fact, standardization compels attention to individuality in those features where there should be individuality, by preventing attempts at individuality in those features where individuality is superficial and useless, and where standardization and quality should prevail. To illustrate again by the piano, it is absurd to believe that by having a back one inch off standard size, by using a 250-pound plate instead of a 235-pound plate, by having round instead of square holes in a plate, by using red felt on the hammers instead of white, that the instrument is given individuality. On the contrary, individuality is in the tone, the lines of the case, the beauty of the finish, the character of responsiveness of the action. These things must be understood by the salesmen, in order that they may retain and transmit to their customers their pride in the individuality of the product, and have an additional pride which comes from the knowledge of the improved quality and lower cost made possible by standardization.

There is no manufactured product which must combine mechanical perfection and artistic qualities to a greater degree than the piano. Like the pipe organ, the phonograph and other musical instruments, it has become an essential part of social, religious, educational and home life. There are instruments de luxe. There are also the great majority of pianos, which are purchased by persons to whom rigid economy is essential, and who therefore demand low price, as well as quality and an artistic product. The typical musical instrument is not found in the homes of the wealthy, where the greatest care is given it. The typical piano is pounded and abused by youngsters who are obtaining a part of their education from it; it is banged about in smoky factories where music has become a part of industry; it must endure the dampness and the extremes of heat and cold in churches, chapels and other public places; it must withstand constant and hard use in theatres, movie houses, schools and conservatories.

If the musical instrument, which must conform to the most rigid artistic requirements of design and finish, have mechanical perfection, always be dependable under the most unfavorable conditions, and be cheap enough in price to furnish an economical means of education, entertainment and relaxation for the poor man, can be standardized and yet retain its individuality, then standardization certainly can be developed successfully in any trade. In order to develop it in any industry, however, the raw material, assembling and selling branches of the trade, and all allied trades, must cooperate. Standardization is a trade problem.

III. AS A PLANT ECONOMY

By WILLARD E. FREELAND[1]

One of the by-products of the war period has been the spread of understanding of the importance of standardization of products as a plant economy. The war taught us the advantages of having but one rifle at the front so that there need be no necessity of carrying a multiplicity of repair parts; also of having the same cartridge fit machine rifles and machine guns. At home the standardization of the tools with which munitions were made enabled plants to lend tools to other plants which were temporarily short of needed tools.

One of the most quickly realized benefits of standardization of products is the reduction of inventories and the possibility of contracting for raw materials far in advance of the time of use. In fact, the possibility of making sales, production, financial and personnel plans far in advance is greatly enhanced by such standardization, and we will all acknowledge that the ability to plan far in advance of production is one of the prime elements in successful management. Standardization of products leads to standardization of raw materials and thus to possible reductions in raw material inventories.

Sales engineering, properly organized, establishes the standards of products, but upon manufacturing engineering falls the task of establishing standards of components, tools, machines, materials, processes and inspection. Let us review for a few minutes the results of such engineering upon work in process, worked materials and finished goods.

Let us presume that a plant, as in our own case, is planning new lines of products. The standardization of these lines as established by sales engineering is usually accomplished by eliminating those items for which there is not sufficient market demand to warrant the investment in tools necessary in modern mass-production. Sometimes such study will lead to the combination of two or more items into one by minor modifications of or additions to a single item. Prior to the war, one of the leading pocket knife makers was manufacturing over 6,000 different patterns; we believe that we are covering the entire service needs of this country with 129 patterns. Similarly, a leading maker of flashlight cases was making 77 patterns; our line comprises 18 patterns. That we are heading in the right direction is made evident by the fact that we are being followed closely by our competitors. By reducing the number of items we are enabled to place factory orders for larger lot sizes and thus to obtain a better flow with a decrease in the inventory of work in process and at the same time tool up to eliminate handicraft methods and thus lessen the importance of the human factor in the maintenance of quality.

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[1] Sales Engineer, Winchester Repeating Arms Company, New Haven, Conn.

The first task of manufacturing engineering is to study the components that make up a line of products. One of the first discoveries usually ensuing is that there is a great similarity in the components for different items and that there is a possibility of standardizing one component for several different items. For example, in our line of fishing reels we have found great opportunities for standardizing components. A part which may be used in several brass or nickel-plated reels will be placed in Component Stores in a polished condition. When an order is received to assemble nickel-plated reels of which this part is a component, the part is drawn from Component Stores and nickeled as a part of the assembling operation. If at a future time the brass reels should be dropped from the line, then the engineer would change his plan of manufacture so that the part would be placed in Component Stores in a nickel-plated condition, as it must always be his aim to have performed upon a component before it is placed in stores as many operations as possible without affecting the use of the part in the maximum number of product items. A direct result of the standardization of components is a reduction of the Worked Materials inventory. This is accomplished not alone by the reduction in the number of components carried in stores but also by the reduction in the quantity of any particular component necessary to prevent a break in the assembling operations. By standardizing components, it is possible to keep a considerable part of the inventory liquid in the form of Component Stores, assembling these on short notice to meet the sales demand. I need not comment on the interest of the sales organization in maintaining such liquid condition of the inventory that it can best serve the customers of the business in the quickest time, and at the same time be more free from the everpresent and sometimes pressing problem of foreseeing and meeting sales demands caused to fluctuate continuously by influences beyond its control.

The standardization of products and components, it has been pointed out, results in longer runs when the machines and tools have been set up and adjusted, with a resultant saving in idle machine time. One of the great savings, however, is the reduction in the variety of tools, jigs, fixtures and gauges which must be designed, made and kept in repair. This brings about a decrease in the tool inventory and a further decrease in the number of highly-paid designers and toolmakers on the payroll.

We have occasion to build much special machinery and here, again, we are constantly striving to expand the limits of standardization. As large users of machine tools, we have reason to praise the efforts of machine tool builders to standardize their products. It is regrettable that so many makers of general and special machinery are trailing in this matter of standardization. A manufacturer need only compare the cost of maintaining a battery of machines which are exactly alike, and assembled so far as possible from standard components, with a similar number of unstandardized machines, to appreciate the economy resulting from the purchase of machines which have been standardized by their manufacturers.

Standardization of manufacturing processes is no small factor in the reduction of production costs. It is futile to look to the engineers alone for action in this direction. The lowliest employee on the production staff may be inspired with an idea that will revolutionize a production process. Good management provides a way to gather good ideas from any source and suitably to reward the man responsible. The elimination of unnecessary operations is the most common result of studies in standardization of manufacturing processes. Sometimes two or three operations can be combined into a single unit of operating time.

In large plants it is not uncommon for an outside observer to see in one department an operation which is a time saver and find other departments doing the same work by older and more costly methods. A few years ago in one big automobile plant I found the same grinding operation being performed in four different ways in four separate tool rooms, and four different kinds of grinding wheels being carried in stores because of this lack of standardization. If nothing else resulted from the study of standardization of manufacturing processes in many plants, enough small leaks would be discovered to offset a considerable portion of the cost. In some types of manufacture there exist certain troublesome peak production loads due to the seasonable character of the products and hence there arises the problem of shifting operating personnel from product to product. Here standardization of manufacturing processes helps not only in the ability to quickly shift help from product to product but also in creating a saving in the time and cost of training new workers.

The effect of standardizing manufacturing processes and the tools of production is most marked in the assembling operations. In the pocket knife industry, the king pin is the cutler, who, with the aid of a peining hammer and a file, takes a lot of non-standard components and assembles them into a non-standard knife. He produces a good knife but the labor cost is high and the quality dependent upon his personal skill. Those of you who sometimes get fun out of a gun can well imagine what would happen if the gun action were assembled with a peining hammer and a file. We require no cutler to assemble our pocket knives. Scientific standardized mass-production methods enable us to use girls as assemblers. Standardization, thoroughly applied throughout the plant, also produces a marked contrast with the non-standard plant in the record of spoiled parts.

The need for inspection standards is so obvious that I shall not dwell upon it. In most industries business growth depends upon quality, quality depends upon inspection, and inspection depends upon adequate standards. Those master inspectors, the treasurer and the accounting staff, can usually tell you very quickly when your inspection standards go wrong. Your customers furnish your inspection standards whether you will it or not; your job is only to formulate them into language or form that your production staff can understand and to see that they are properly installed and maintained.

In adopting standards there must be established a mechanism for the replacing of old standards by new, as the development of standards has a tendency to keep an organization from developing and installing changes. One trained in marketing recognizes that pressure from distributors for special merchandising features has caused the adoption of many minor changes in the past which would never have been adopted if products had been standardized, but many products would have been more economical to both manufacturer and consumer if these changes had not been made. Where an important improvement has been accepted, however, proper mechanism should be set in operation to clean up all components which have thus become non-standard, retaining a sufficient supply for repair parts for a specified time as a service to the purchasers of the old form of product and to begin the manufacture of the components of the new type.

Standardization, in reducing the number of items in the line, has naturally the direct effect of reducing the finished goods inventory and this, too, without decreasing the service rendered the customer. Usually better delivery service can be rendered, and this point is accentuated if the manfacturer has to maintain a chain of warehouses throughout the country.

Plant economies resulting from standardized products may be summarized as follows:

1. Reduction in number of product items;
2. Earlier plans and schedules;
3. Placing of manufacture on a tool basis;
4. Decrease in the variety of tools, jigs, fixtures and gages;
5. Decrease in number of production processes;
6. More nearly correct economic lot sizes in production orders;
7. Saving in idle machine times;
8. Decrease in raw materials inventory;
9. Decrease in tool inventory;
10. Decrease in work-in-process inventory;
11. Decrease in worked materials inventory;
12. Decrease in finished goods inventory;
13. Better ability to meet fluctuations in sales demands;
14. Gains in quality, quantity, cost and service.

DISCUSSION

A. W. SHAW[1]: There are two comments that I should like to make. One is that the standardization programs of the Conservation Division were not the outcome of exact plans that we had when the Conservation Division or its predecessor, the Commercial Economy Board, was established, but that these methods were answers to certain problems. In other words, these methods were the answers that developed from necessities that arose in the war.

In the beginning our task was the conservation of the resources and facilities of the nation in time of war, or as President Wilson put it, "the studious conservation of resources and facilities by means of scientific commercial and industrial economies." And the very obvious approach to our problem of conservation, and the approach that most often was brought to us, was to make a distinction between commodities that were essential to the civilian population in time of war and those that were non-essential, and to cut off the manufacture of the latter. But it soon became obvious that you could not draw a definite line between essential commodities and non-essential commodities. You might on one hand agree upon a commodity which was less essential and on the other hand on a commodity that was most essential. But there was a wide range of articles that could not be classified in one group or the other.

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[1] President A. W. Shaw Co., Chicago; formerly Chairman Conservation Division, War Industries Board.

So we adopted a policy of eliminating the non-essential uses of labor and capital and material and equipment from all types of industry. We gave up any distinction between candy and bread, let us say, but we endeavored to release an amount of capital and material and labor and equipment from all industries sufficient to supply that fund of resources necessary for the conduct of the war.

From that point then was developed the standardization program—"standardization" being, I think, a most unfortunate term. It really should be "simplification," or "a program of elimination." I wanted to explain to you how this work developed, to point out that we did not go to Washington with a definite program of standardization, but that simplification seemed to be the only way in which, and by which, we could release from the resources of the nation those resources necessary for the conduct of the war.

Here is one more point I want to make. I am not at all in sympathy with suggestions of new governmental agencies with powers of inquisition and enforcement to continue this work in case it proves advisable to continue such methods as were evolved out of war needs by the Conservation Division.

I feel that the first stage is to develop conservation work in each individual concern and from that into the industry and from the industry go to the associated groups of industries. I think there has got to be an evolutionary process toward methods just like the process we went through in Washington.

The first step to take in a business, it seems to me, is to bring the sales department and production department together. Standardization in one sense connotes a production problem. All production men understand the advantages of standardization. After taking this first step in the individual concern, you can go just as far toward standardization or simplification in it as you possibly can. The next stage is to go into the industry and to work out from the industry itself toward some coordinating group or some coordinating agency, logically the Department of Commerce, that will make it easier for a general application to be brought about.

Thank you for this opportunity to tell how this work developed, how the solution to our problems came from the business men themselves. I also am glad to give my point of view on establishing any new agency of enforcement. We certainly do not want the Government to take on any more regulatory activities.

HOWARD COONLEY[1]: The papers this morning impressed me with one very strong thought, and that is that just as Taylor followers have only recently begun to consider seriously the sales problems, so have they only begun to think of standardization from the sales and merchandising point of view. I am inclined to think that the producer after all is the least sufferer, and I say that realizing that I am largely a producer.

Over a series of years the producer is bound to get back his money and some interest on it. Here and there a business falls by the wayside from lack of success, but it is picked up by somebody else and the dear public must, as in every case, pay the bills. If the producer has five thousand instead of five hundred items it worries him and bothers him, but he finally extorts from the buyer his pound of flesh.

Nor is the merchandiser himself the keenest sufferer. He goes ahead as a general rule without much knowledge of what he is doing, without any system in his own business, and he in turn also makes the public pay. Therefore, to my mind it comes down to the very simple proposition that the consumer pays the bill and therefore the consumer is the one that should be primarily interested in standardization.

How does he pay? He pays first of all by errors in choice because he has no definite knowledge of what he should buy in order to obtain the best service. He pays by slow deliveries. He pays by high prices. I know there is not one of you in this room who as he has to move from place to place in the world—and we have to move a great deal these days—and possibly goes into a rented house or a rented apartment and finds the electric lighting fixtures in bad shape and tries to get a plug that will fit some particular socket, but finds that there are any number of different shapes, —round sockets, oblong sockets, upright sockets (I don't know the technical terms)—but he must in the end go to much bother to match the socket with the proper plug.

I feel too that standardization should not only consider the physical aspect of the product but should consider also the aspect of price—possibly I will say the price list. To give you an example I am going to take you into the field of the Walworth Manufacturing Company because that is naturally the one with which I am best acquainted.

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[1] President Walworth Manufacturing Company, Boston, Mass.

I don't know whether some of you can believe this—I could not when I came into this business for the first time seven years ago—but it is a fact that today the price list on standard cast iron screwed fittings places the so-called straight sizes, the ones which are in the greatest use and greatest demand, on a basis where under normal conditions they are sold at a decided loss. When we made our first careful examination into costs in 1913, we found for instance that we were manufacturing castings which of necessity must be of such close grain as not to blow or leak. We were finishing them very highly, threading them, cleaning them, packing them, and delivering them to our customers and paying the freight, at $1.85 per hundred pounds. If any of you has ever been in the manufacturing business, at least the business of manufacturing cast iron, you know that at no time was this possible.

Now, in this case the manufacturers in our line have deliberately used this list in the hope of keeping others out of this business. They have deliberately placed this small number of sizes but great poundage on a basis where they believed any small manufacturer who tried to get into the business would fail.

It is the natural thing for the small man to start in making a few sizes that he can sell generally. It was the manufacturers' opinion, and it is the honest opinion of some of them today, that by keeping those sizes on that low price basis they can keep other people out of the business.

Having been a small manufacturer I believe that is absolutely unsound. The man who wants to go into business, makes his investigation with that desire so uppermost in his mind that he always decides it is the thing to do to go into that business. I have been trying now for seven years to get the manufacturers away from that idea and I have not yet succeeded.

I am going to tell you of another case in our line which is even worse, and that is the matter of malleable fittings. We manufacture, I should say, probably some one thousand different sizes and shapes of fittings. No two manufacturers make them alike either in weight, in dimension, in thickness of wall, or in radius of the bend. We manufacture both British thread and American thread. We make them both in galvanized and black. We sell them on a pound basis in this country and on a piece basis for export trade. We sell them to jobbers on the West coast on a pound basis who in turn convert them to a piece basis.

What does that mean to the jobber? It means to him that if he buys ten pounds of one fitting he may get twenty pieces. If he buys ten pounds of another he may get twenty-five. He does not know whether the fittings of which he buys twenty-five and pays tne same price that he has heretofore for the twenty, will properly suit his work, whether they will stand the pressures for which he has been using the heavier fittings. But even worse than that, our list price is on such a basis that under normal conditions we make a profit on galvanized malleable fittings and we lose money on black fittings. And that again is a thing that is done with a knowledge on the part of some manufacturers and with the belief that they are again keeping people out of business who cannot galvanize their own fittings.

From the standpoint of the buyer that has another very serious effect. No producer wants to sell any part of his product consistently at a loss. Therefore, in order to make a consistent profit on malleable fittings we all have to say to our salesmen, "You must not sell more than fifty per cent of your malleables in black; you must sell at least fifty per cent in galvanized, so that we can get our money back and a little more." In certain trades, such as the oil trade, they don't use galvanized fittings. They don't need them because the very use of oil serves to lubricate the fitting and makes a black fitting as serviceable as a galvanized. So we are in the very foolish position of saying to the oil trade, "We don't want your business because it is not profitable, unless you can buy from us some merchandise which you in turn don't want." And as yet the user of that merchandise is not educated to the point where he raises serious objection.

I think the major emphasis in the addresses was laid on the fact that the blame for this rested with the sales department. I cannot say that the merchandiser is not very considerably responsible, but he certainly is not entirely responsible. I think it is true, as was brought out in the first paper, that the desire on the part of the sales department to create business has made them change from one style to another, from one color to another, and possibly forced immediate business to the detriment of the trade itself. In the shoe business at least it makes it necessary to practically scrap a great deal of a perfectly sound product. Now in that way the merchandisers are educating the buyer wrong. They are not looking to the good economics of their business. They are looking to what they think is their immediate advantage.

In our line of business however the engineer, the scientist, is very largely to blame. I presume a great many of you deal with engineers and architects, probably a great many of you are engineers and architects. Up to recently—I say recently because I think a good deal of this was stopped during the war—it was felt by the engineer that he should make a study to find out what specialized valve, what type of bend, he should use without regard to what others used. He has demanded special mixtures. He has demanded special thicknesses of wall. He has demanded special bolting. He has even gone so far as to force us to use non-standard bolts in order to meet his specifications. Now this results again in a tremendous burden on the consumer. The vessel that goes from port to port cannot obtain its replacements except from special sources of supply. If the vessel goes from this country to France or to England it cannot use the local product, because if it was built in our yards its fittings were tipped with the American thread whereas if it was constructed on the other side the British thread had been used.

I think we need to educate our engineers and our scientists to realize that they must help along on this program of standardization. I am very thankful to say that at least the American Society of Mechanical Engineers is taking a very great step in that direction. In standardization as in everything else the remedy is through education. I believe the Taylor Society is primarily an educational instrument. I believe one of its functions should be to study how it can educate not only the producer, not only the merchandiser, not only the scientist, but also the consumer.

I stated some time ago that it is my belief that jobbers as a class know less about their business than any other group. Most of them have no proper inventory records. Most of them have no real knowledge of their profits on various lines. I think it is not too much to say ninety per cent of them know nothing about the trend of their business except by their bank accounts and by their balance sheet at the end of the year.

It seems to me one function of this Society should be the education of the jobber, and I agree heartily with Mr. Smith that that can be done best through the trade associations.

It seems to me that we should teach them the necessity of proper balance of stores records. I know no other way by which they can really learn business. I think we should teach them to study their details of turnover, which they can get only through a proper balance of stores record. One of the branches of the Walworth Company's business is that of the jobber, and it is a fact that of the merchandise that we carry in our jobbing branches less than one-third turns over three times a year.

I think we should teach the jobber to study his office expense to the point of finding out what part of his cost is given to these slow moving items and what part is given to his real standard product. I think we should help him to realize that his study must go further to see how much of his display room is given over to the show of these items which are not economical either for him or the consumer, and how much of his storage space is given over to that purpose. I venture to say it would be a revelation to him as it is coming to be to us.

The Walworth Company has been greatly concerned about these very problems and we are trying a method by which I believe we can bring this problem of turnover so thoroughly to light that we can readily correct it. We have picked out of our vast line of some twenty-three thousand different finished items six hundred which we consider as "significant." That list of six hundred was worked over by all our departments. Our original thought was that we would pick out five hundred items as a test, but as we found it was absolutely impossible to confine ourselves to five hundred the list was expanded to six hundred. This list was made with the help of all departments of our business,—sales, production and financial. We are using that list as the basis of our sales and production campaign. It is the foundation of our budget system. We are asking each one of our merchandising units to use those six hundred significant items as the basis of their sales estimate for the first quarter of 1921. To do this they must study their own businesses in detail. It gives them an opportunity to really learn their business and has made them realize how few of the many thousand items we carry have an economical turnover.

The sales estimates so arrived at are in turn submitted to the Home Office and after proper revision and consolidation are made the basis on which we predicate our production program and our finance program. That is a detail of the whole greater budget system which we are working out, the one of first finding out our trade requirements, then keying those into our own production ability, basing our financing program on the result, and sometimes finding that it is impossible to finance the result and therefore mending our program to suit our finances.

Now just one other point; that is the great opportunity for *proper* advertising as a means of standardization. I think so far advertising has very largely been abused in that it has been used to foster some specialty. The world will not progress on specialties. My own feeling is that it should also be the endeavor of this Society to turn the mind of the advertiser to the wonderful channel which he has of interesting the public in standardization of product.

QUESTION: Is there any standardization going on in the manufacturing of your line?

MR. COONLEY: I am very glad to say that we are working on the standardization of malleable fittings at the present time. We have asked the help of the American Society of Mechanical Engineers. We are going to use the standard of dimension as a basis for standardization of proper price listing and a proper reflection of standardization throughout all the phases of business.

PAUL T. CHERINGTON[1]: My first point is the fact that in many types of product the personal preferences of buyers or kindred influences make standardization impossible or highly undesirable as a practical problem for the manufacturer. Professor Cunningham's case of the minister who objected to having his efficiency measured by the number of conversions per pew-hour, suggests the distinction I want to make between the standardization of the product and the standardization of the combination of the product and the accompanying services which it is the real problem of many manufacturers to deliver. It is unquestionably the task of the minister to bring about the spread of the ideas he is preaching, and the number of conversions is perhaps as good a measure of the spread as could be found, but the real product is a combination of conversions and other human reactions too complex to be standardized. In the field of manufactures, fabrics furnish concrete illustration. In a large measure their value and the salability is due to a lack of standardization. To standardize them in any essential particular would be to destroy their chief desirable characteristics.

The second point I want to make is the obvious one that in the case of such products there is not necessarily any burden imposed on industry by this inherent lack of capacity for standardization. The costs of this diversity and of the risks it involves are necessarily figured in with the other necessary costs of distribution. The burden, of course, falls on the public, but on the whole it is not heavier than any other burden due to desires for expression of individuality. Those desires are, for the great mass of humanity, ineradicable, even though the ingenuity displayed in expressing them is ordinarily restrained to a pitiful degree.

There is, of course, no fundamental reason why we should not work out standards of dress analogous to the peasant costumes prevalent in certain regions patronized by tourists. By salary, income, occupation, age, or by complexion, or by free range of choice between a few types (as was done with hats for "female yeomen" in the navy) we might standardize clothing for say ninety per cent of the population, leaving the display of taste in fashion with the ten per cent economically competent to bear the necessary cost. However desirable such action might be theoretically, it is. of course, not possible without complete standardization of the humanity under such a regime.

The world might be more thrifty, but for many people it would be insufferably dull. As matters now stand the greater part of the yardage produced in, say, the wool manufacturing industry, is of a relatively few types, but the multiplicity of designs and types in the minority, while it materially complicates the business, cannot be regarded by the manufacturer as an unmixed evil. Nor is it clear what really worth while end would be gained by trying to reduce all fabrics of wool to a basis of production as uniform as screws or wire nails.

A final point is the thought that, both socially and economically, there may be some profitable field for action even in such lines as do resist complete standardization. This action would, in some instanees, begin with a recognition of the distinction between those portions of the industry in which standardization is possible and those in which it is not. To continue reference to the wool manufacture, it is not inconceivable that a relatively few standard specifications for blankets, uniform cloths and other staples might be worked out which would permit that substantial portion of the industry which does not depend on style elements to meet the essential demands of its consumers more accurately and at less cost than is now the case. Even in this field, however, the difficulties are serious and there is no simple, off-hand solution which would leave producer and consumer better off than they now are.

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[1] Secretary National Association of Wool Manufacturers, Boston, Mass.

Frank B. Gilbreth[1]: I want to bring out a subject which is very near to my heart,—that is, the importance of the dependent sequence in standardization. The illustration of the rubber depending upon the shoe and the shoe upon the last opens a discussion that has no end to it. I make a proposition that this Society make a study in the standardization of shoes! When you have found a shoe that is right, then take your courage in your hands and insist that the foot upon which the last depends is the same shape this year as it was last year and will be the same next year, regardless of style.

In a sequence of rubbers, shoes, lasts, feet, we are able to build our standard upon something that is known and remains fixed. This is, unfortunately, not always the case in a dependent sequence and the effect upon standardization should be emphasized.

Let me give an illustration. In 1913 Mrs. Gilbreth and I decided to attempt to standardize just one thing in the household. We decided that if we could get one standard that was right, and that all people would agree was right, we could consider that the method used in making that standard was worth while. We decided to attempt to standardize the making of a bed, as a simple operation used in all households, institutions, etc. Having selected bed making, we proceeded to make a survey of how beds have been made, first according to usual household methods, and second by experts. We turned the house into a motion study laboratory and invited the teacher of nurses from one of the most prominent colleges in the country. We invited also a head nurse from a hospital, and two of the best doctors that we could find, one of whom is in charge of the largest hospital of which we know. In an endeavor to trace the dependent sequence we said that as the sheet and blanket and spread must be laundered, we would bring in a teacher of laundering from a college of home economics.

So in the middle of the home-made laboratory we had a real bed and all the coverings and this group of experts, and we set up the motion picture camera and wound up the clock five different times, because the clock only runs about an hour at a time, but we could not get to work because our group of experts could not agree on how the bed should be made. As fast as one would start demonstrating her method, the others would explain why the method would not work, and finally when we had a method that seemed likely to prove acceptable, the expert on laundering said: "There is not a machine in the world that can iron those sheets the way you want them to make those beds, and it would cost fifty thousand dollars to make laundering devices to fix them." It remains to be said that we have not yet been able to standardize this simple operation, for the one reason that there has not been an agreement as to the method, consisting of an investigation of the dependent sequence and a willingness to standardize the first stage in the sequence and to study and standardize consecutively the succeeding stages. It must be noted that the experts were cooperating, that each was a recognized authority in his or her field and a producer of worth-while results in that field. If, with such a combination, it was impossible in the time available to obtain one simple standard, the difficulty and complexity of the problem may be appreciated.

I have two suggestions to make. One is that we attempt to make one simple, definite, unassailable standard as a sample of what could be done. The other is that we apply measurement to the standards we have made in order to determine their scientific value. A reviw of the history of standardization before the days of scientific management and since shows that thousands and thousands of standards have been made and abandoned. The amount of money that has been wasted on false standards, homemade standards and pseudo-scientific standards is disgusting. The total cost of existing standards today, as determined by the cost of standardization divided by the number of surviving standards, would shock the scientific managers of the country if they considered it. The need for standardization is obvious.

To return to the illustration of shoes. I had a hand in standardizing the methods of fitting shoes for four million officers and men in the army. The credit of this work should go to Elmer J. Bliss of Boston, who has invented a method and device for fitting shoes. Over eighty per cent of all men in the army were misfitted. These are quartermasters' records. If you could see first hand, as I have, the collection of pictures of Colonel Owen in Washington,—that man who did such brilliant, though as yet unappreciated, work of standardization in the Medical Department—if you could see this collection of pictures of "shoemakers' feet," you would be as shocked as I was. It is certainly an indictment of the intelligence of all men. I criticise with reason, for I myself bought six pair of army shoes of the most excellent leather, four of which were too small because I forgot that I should be wearing heavy stockings with them.

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[1] Consulting Engineer, Montclair, N. J.

I suggest, therefore, that this Society select shoes as the subject of the first scientifically derived standard, because of the dependent sequence involved and because such an excellent start has been made toward making a real standard. I further suggest that the standards already suggested by the members of this Society be re-examined, with the dependent sequence in mind, in order that work in standardization which bears the name of the Taylor Society may be really scientific.

Henry W. Shelton[1]: Most of our discussion so far has been upon the details of standards to be adopted. This is helpful, but the possibilities of such detailed consideration are unlimited. I should like to suggest one or two of the general principles underlying and governing all sound standardization.

If we agree upon the simple definition that a standard is "something carefully thought out and agreed upon as the best possible at the time" we shall avoid some of the misunderstandings many persons have on the subject in general. Standards may cover such varied subjects as materials, tools, machines, and work places, methods and operations, routine procedure, and general policy or principle of a company. Standards are the foot-rule by which results are measured. Therefore it is desirable that they be extended over the greatest possible portion of the whole business. This involves of course the establishing of conditions such that necessary exceptions to any standard will be reduced to a minimum.

There are three general phases of standardization:

a. The establishment of standards.
b. The maintenance of standards.
c. The improvement of standards.

In order to establish a standard way, for instance, of doing something, it is necessary to review the different ways in which it is now being done, then to find out the one best way. This should be better than any of the old ways because it combines the best of each of the old ways. Finally, after this careful deciding of what the new standard *should* be, it is necessary that everyone agree that that is what it *shall* be. You may have a standard in name, but you really have not one in fact until everyone agrees to it.

The only way to maintain a standard is to live up to it. A poor standard followed all the time gives better results than a good standard followed sometimes and not other times. The surest way to prove the strength or weakness of a standard is to live up to it. Such testing of every standard is desirable in order that the good standard may be proven and the weak spots of the poor standards shown up for correction. So no matter how defective an established standard may be considered by anyone, he should live up to it to the limit of his ability.

Responsibility for work violating an established standard should rest with the individual. The company should assume full responsibility for errors and losses resulting from the strict following of established standards. Inability to follow a given standard should be reported at once to the executive in charge.

This testing of existing standards by living up to them points the way to the improvement of standards. A given standard holds good only until a better standard can be found to take its place. That is why standards properly are not dead, but full of life and progress. Great care should be taken, however, to make sure that any proposed change of standard really is for the better and that it is fully examined and tested before being authorized and established. Mistaken changes in standards are too easily and frequently made.

It is obvious from what has been said that true standardization and the application of the "exception principle" must go hand in hand. Just as standardization enables the manager to know what is normal, so the exceptions to the standards enable him to measure change, good or bad. Only by knowing that the exceptions are exceptions and not the rule can these sign posts be accurately interpreted, and real progress made.

One word of warning regarding the temptation to impose standards without the agreement or consent of those concerned. If this is attempted the desired results will never be achieved. Whether the consent is based on a full understanding of what is proposed, or only on faith that what is proposed is right, consent itself must exist if the standard is not to become nullified and a dead letter. An unreliable standard in a shop is as much to be avoided as an unreliable yard or gallon measure. No standard can be relied upon in practice unless both the intellectual and emotional consent that the standard is reasonable and desirable is obtained from those affected by it.

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[1] Industrial Engineer, Philadelphia, Pa.

Richard A. Feiss[1]: The aspect of standardization of product which interests me in this discussion is its benefit to the consumer. Of course as manufacturer I am interested in the benefit to production and selling and to the coordination of these. But this afternoon it is the consumer.

Standardization from the community point of view is of tremendous importance. With *proper* standardization there would be better stabilization—fewer high prices, fewer mills shut down, and so on.

Standardization through trade associations has possibilities and is important, but it has its limits. It can standardize sizes, grades, accounting, selling terms, and so on, but it is doubtful whether it can standardize styles and variety.

It is in the plant that real standardization must take place. The trade may have a variety of products to satisfy the community, but the plant does not need to attempt to supply all that variety. It can decide upon what part of that variety it will attempt to supply and then standardize that part. This combines standardization—with its advantages—in the plant with variety in the industry.

We have done just that. We have decided what we can produce best, emphasize that, and let other manufacturers of clothing produce what they can make best. The retailer today does not buy all of his stock from one manufacturer, no good retailer can survive unless he buys from several manufacturers. He therefore wants from each that which each can produce best. That gives the manufacturer an opportunity for standardization of what he decides to produce. It means more economical processing, better quality at a given price, long-run plant policies, continuity of production and—in short—advantage to manufacturer, retailer and consumer.

Ray M. Hudson[2]: I am very much interested in the attitude of organized labor toward standardization, that is, with reference to standardization within the plant. It has been my pleasure and privilege to be associated with two industries in which there has been considerable constructive work done in changing from a variety of products of more or less complication to a relatively smaller number of products of a complex nature. One was the manufacture of an automobile; the other was the manufacture of tractors. There could well enough be standardization of the other sort in the fifty-seven varieties of tractors now on the market but I am not concerned with that part of it. It is the internal standardization of our own product, and of the processes incidental to production.

In our plant we have a considerable proportion of organized labor. Naturally when Colonel Babcock went there, the workers in our factory, knowing the reputation that he has for applying scientific management principles, were quite suspicious of his motives and purposes. However, those of you who were at the Harvard meeting last September probably recall some of the discussions in which a labor leader in our own plant participated. The man who spoke at that meeting is now president of our local trades and labor assembly, the strongest element in which is the machinists' association. We hear him quoted frequently and often as to his views, through the members of our shop committee.

In my weekly meetings with that committee I have found that their chief fear of standardization is that it will destroy their craftsmanship. The average machinist feels that his union card endows him with certain superior abilities which a person not possessing that card cannot possibly ever attain.

So these men fear that they would become routine workers through having repetitive processes forced on them,—would become more automatons than they would human beings.

Everybody was skeptical about the results we would get from standardizing processes, methods, etc. We have found as an actual fact in our own experience that standardization has done more to educate and help those men in the advancement of their own profession or work; that it has also stabilized conditions within our community, for we are running on a more even curve in employment than we have had in previous years without that standardization.

Consequently those men are beginning now to appreciate more than ever the advantages of standardization, and instead of the antipathy which we encountered at first from that same organized element, we are now getting some constructive suggestions or contributory effort, toward the further establishment of those internal standards.

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[1] Vice-President and Manager of Manufacturing, The Joseph & Feiss Company, Cleveland, O.

[2] Manager Methods and Personnel, Holt Manufacturing Company, Peoria, Ill.

Mrs. Carleton Parker[1]: This is really a rather unfair advantage to take of a person who is supposed to be as weary on Saturday afternoon as the average factory worker; but I shall have to admit that other duties made me lay off this last week. If this had been a week ago today, I should have been in somewhat of a collapsed state, because I do find factory work, conscientiously carried on, rather a strain. I have been doing more sedentary labors during this past week because I wanted so badly to attend these meetings and I felt I couldn't get in all of them and work a foot press at the same time.

On the side of labor, which is my main interest, there is a big point to be made in the idea of standardization which I don't feel has been brought out. To achieve any state of industrial peace and greater efficiency there has to be a much greater cooperation of the human element, a much greater cooperation between management and men. That cooperation cannot be achieved without a great deal more understanding on the part of labor of the actual industrial processes. The more complicated those processes the more difficult it is going to be for labor to understand them in any detail.

Given the most simplified of factory procedure there would always be enough variety to make it interesting from the point of view of the factory worker sharing to some degree in management. Take the most extreme form of variety production, the average worker today sees but an infinitesimal part of it. That has been one of the disappointments to me working as a factory hand. One of the reasons why I wanted to go into the work was the mere curiosity of understanding better all miracles that lay behind any finished article as you view it today. You see a door knob and you have a feeling that it was born that way in the door, and I really wanted to know something of what got that door knob where it was. I find I get put on a little job where hour after hour and day after day I do the same infinitesimal piece of work. As far as labor is concerned, it has come to be such an unskilled process at best that from that point of view I see no valid objection on the part of labor that standardization of process will detract from the laborer's skill.

At best—and I think it is at best—we are tending from trade organization to industrial organization. The great point in favor of industrial organization is that there is far more education in actual plant management to be brought about through industrial organization than through the separate craft organization. The less variety in the industry the more capable labor is going to be to cooperate intelligently with management. There is not going to be so much to learn about the business and what is learned can be better learned.

From the point of view of the female consumer—and we are told that the female is the purchaser of the nation—there is this also to be said: surely there is no need for the variety that is foisted upon consumers. Big business is responsible for that, because business, in spite of the remarks somebody made here previously, has grown away entirely from the idea of community service. It is no conscious fault of business. The very size of large scaled production has meant that large scaled producers must be kept busy making money, and if there is not enough demand for an article already produced then something else must be invented and advertised and a buyer found for it.

If a large variety does not exist in an article worth while having, the consumer is not going to stand off and say, "If that is manufactured in only four colors instead of seven I am not going to buy it." If it is something that is worth while it is going to be bought. And the point of view that industrial stagnation would follow, I think is beside the point. A certain type of industrial hecticness might be eliminated which would be entirely "to the good."

I do believe that there is a distinction to be made between objective standardization and subjective standardization. That may be again where my feminine prejudices enter. I can't see but what the nation as a whole could find no great psychological repression if everyone had to use all twenty-one inch pipes instead of some twenty-two inch pipes, but I don't want all ladies wearing the same hats.

And I have enough faith in the perversity of the female sex to think that no matter how much standardization could be put over even in the matter of hats, there would be something developed which would allow a perverse woman to look as if her hat were a little different from the hat next to her.

But, especially as pipes mostly are under-ground or between walls, I should imagine perhaps there might not develop the need of the scientist in pipes that Mr. Gilbreth spoke about as necessary in the matter of shoes. I told Mr. Gilbreth a story and he is going to use it sometime and act as if it were his, so I might as well get what credit I can for it today. In the matter of shoes, I told him the last time I went to get a pair of shoes when they were making an extremely narrow last I said to the shoe clerk, "I can't possibly wear that last; haven't you something broader than that?" He looked at my foot and then looked at me with serious disgust. He said, "The trouble with you, madam, is that you have ruined your foot; that is its natural shape."

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[1] Author of *An American Idyl;* now conducting investigations as a factory worker.

T. W. MITCHELL[1]: There seems to be some apprehension that a standardization of product is going to unduly limit the variety which is at the command of the customer. None of us wants the ladies to be restricted to one particular design of hat. We want as much variety as we can afford. But it seems to me that a large part of the variety which the producers offer the public is entirely lost.

For instance, several years ago I worked for a little while in a handkerchief factory. There I found that there were 2,500 different designs of handkerchiefs being offered to the public. No ultimate purchaser of handkerchiefs ever looks at 2,500 different designs of handkerchiefs, or 500 designs, or 100 designs; and if we tried to put 2,500 designs of handkerchiefs before one customer the customer would be appalled and not know what to do with them.

I want to give another illustration to show the effect of the great variety of product that is offered by the manufacturers. A certain clothing manufacturer offers to its customers twenty-four models of sack suit. The piece goods buyers bought over one thousand different suitings and this concern offered each of those fabrics in each of those models. Right there the customer who buys one suit was offered 24,000 choices. But each of those models is offered in several different lining constructions, three at least—full lined, half-lined or three-eighths lined, quarter-lined and sometimes what is called sport trim. Thus every customers has 72,000 choices. But of the lining, it may be alpaca; it may be all silk; it may be alpaca body and silk sleeves. That makes 216,000 choices. I shall say nothing about the variety of shapes,—regular, stouts, longs, sorts—or the variety in sizes; but stopping with the 216,000 choices already shown, I will say that on the basis of the total sales for a season, if each customer exercised all possible variety of choice that is offered to him, every suit that is manufactured by that company would have to be cut and processed separately.

That the customers are not nearly so insane as the manufacturer believes is shown by the fact that in that company's factory the suits go through in lots averaging twelve to the lot. This company in addition to offering twenty-four regular models, offers to make special models for customers and actually makes fifteen customers' specials. Of those fifteen special models there is no model the sales of which amount to as much as one-half of one per cent. Of the total sales the sale of one of them amounts to fourteen thousandths of one per cent. In the case of the regular models there is one model the sale of which amounts to two thousandths of one per cent of the total sales, and a great number of other of the models sell in correspondingly small quantities, less than one per cent.

As a matter of fact the great bulk, practically ninety per cent, of the sales of this company concentrate on six or seven models.

One point that I want to make is that the great variety of models that are offered are lost to the ultimate consumer. He does not exercise that choice and does not want to exercise that choice and couldn't do it. The other point is that this great variety which is manufactured within a given plant means expensive, unnecessary production.

W. H. LEFFINGWELL[2]: It has always been a mystery to me why, though we all seem to agree on principles, when we each commence to define our principles we are apparently as far apart as the poles.

I am very glad to have the previous speaker bring out these startling figures. The difficulties of standardization are so frequently argued from the standpoint of styles. We are told over and over again that we must all wear the same hats and the same clothes.

Yet, as a matter of fact, the difference between the clothing of the men in this audience is so slight that only a keen observer—perhaps a clothing manufacturer only—could tell the difference. Look at the hats of a crowd of men—they are practically all alike. Those are the things in standardization that our bright critics pick on. They say we wish to rob mankind of individuality. Yet they are the very things that are more standardized than anything else.

Another point that we ought to take home, I believe, is why is it that although there has been improved machine after improved machine, although we have increased the productivity of the worker, the productivity of the plant, the productivity of the nation, the cost of living is constantly increasing? That is a point we ought to be considering very carefully. We do things so much better than they have ever been done before, yet it apparently costs more to do them that way and the difference is not in the rise in wages or anything of that nature.

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[1] Industrial Engineer, Philadelphia, Pa.

[2] Leffingwell-Ream Company, New York and Chicago.

I believe it is the dissipation of energy through competition. These 216,000 choices do not mean the choices of the consumer, but merely mean, as one of the speakers said this morning, a means of building up lagging sales, a bright idea of some salesman or sales manager to produce a certain style that somebody else does not produce. I believe that also brings out the point that there must be a coordination between the various departments of business, a coordination especially between the department of sales and the department of manufacturing.

SANFORD E. THOMPSON[1]: From a labor standpoint perhaps most of all is there the greatest need of standardization. This has been mentioned already, particularly the seasonal employment, due to lack of standardization, in clothing manufacture, and it is the same in the manufacture of shoes and various other commodities. Not only does this phase effect the workers, but, also, there is the time which is lost by them in the factory and in irregular employment from day to day. Let us consider this, for example, in the manufacture of shoes.

In making shoes the lasts control the manufacture to a large degree. Lasts change every season, comparatively few lasts running over from one year to another; consequently the manufacturer uses as small a number as possible. On this account, and the fact that the lasts must be carried for all sizes and widths, the manufacturer can run through only a small number of shoes of the same kind in one lot, usually from two to three dozens of a style, and these include the required variety of sizes and widths. Also, he must plan his lots ahead so as to make his cycle of lasts come right, not simply for style but for size and width. Further, if one lot of shoes gets behind while on the lasts, through shortage of some special findings or other causes, the entire schedule is broken up.

Let us see how such delays as occur through these causes effect the worker. As a result of these variations we may have in the same day's run three dozen pairs of low shoes made with one kind of leather and of one particular style; three dozen pairs of high shoes, some of the operations of which may take, for example, three or four times as long as the operations on other styles. We may have three dozen pairs of white shoes, and so on; some of these styles have one kind of trimming, others another. Instead of being able to run these various styles through in large lots and route them to the machines and groups which handle them to the best advantage, they must be worked on one after another, and the work dove-tailed in as best it can be.

This means that in a department a certain machine, which is adapted to one style of shoe, may be busy all day; at other times it may be busy only half a day. The operators on certain operations are, therefore, frequently thrown out of work, and, as is the custom in shoe manufacture, they lose their time. Furthermore, the shoes coming from one department to another vary from one day to the next in quantity because the character of the stock and the grouping of styles is such that a relatively smaller amount comes through on one day than the next. These are actual and not theoretical conditions in nearly every shoe factory in the country.

As a result of this lack of standardization, the piece worker loses a considerable percentage of time while nominally employed. Eventually, however, this must come back to the manufacturer, and finally to the buyer of shoes, since for irregular employment, whether it be through seasonal variations or delays occurring through the day, higher piece rates must be paid than for continuous employment.

To a certain extent these difficulties can be aided by standardization, particularly by well worked out sales policies. There soon comes a time, however, when the limit is reached. Shoe salesmen tell us that there is getting to be as much style and individuality in shoes as there is in bonnets. We must not neglect, therefore, the other side of the matter, the standardization of work in the shop so as to bring down the cost of manufacture of the fancy styles—the styles that appeal to the eye. And this is just where scientific management in the shop must cooperate with scientific sales methods. To a certain extent our salesmen for best economy and profit must consult with the production departments; the sales must tie in with the shop. The production man may say to the salesman that styles must be standardized. On the other hand, the salesman may well say to the production man that he must standardize his processes and methods so that the cost of manufacturing the more fancy styles, which he can sell for larger profit, must be brought down to a figure scarcely higher than the plainer shoe.

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[1] The Thompson & Lichtner Co., Industrial Engineers, Boston and New York.

Dr. N. I. Stone[1]: I hold no warrant to speak in the name of labor but as a labor manager who is coming in daily contact with labor in the factory I think I can speak from practical experience. Even before I took hold of my present job, as an investigator going through factories I was struck with the fact that labor instead of objecting to standardization from the standpoint of a lack of diversity and monotony to which Mrs. Parker referred, quite to the contrary preferred it.

All of those who have worked in factories. those of us who are accustomed to intellectual labor, want to judge the worker from the point of view of our own preferences, whereas the worker has a psychology all his own. The great bulk of workers have grown up in a factory from childhood. Instead of seeking variety they prefer a definite standard set of motions, and one great difficulty that every manager has is to make a girl change from an operation she is accustomed to, to something else. "We have always done it that way; we don't want to do it this way." You have to argue that you can prove that the new way is the better way. She will object to it, invariably. You take a modern factory, whether it is clothing or shoes or anything else, and there is an extreme sub-division of labor which means that each particular section, whether it is of a garment or of a shoe, has only a small number of people working. You may have a section of four people turning out a certain part of the garment, although you have a thousand people in that factory. The result is that if one out of the four is missing there is a decline in production of twenty-five per cent from that one section, which will hold up the rest of the production of your factory.

It therefore is an extremely important thing to every factory manager to be able to get a worker from another section as a substitute on that operation. The worker objects to the variety which we imagine and assume—most of us who haven't been in factories—that the worker would love and prefer simply because we would prefer it. Theirs is an entirely different psychology.

When I first visited the Joseph & Feiss plant I was surprised to see that workers there whenever asked to change from one operation to another, did it with a smile, and it took me some time to get on to the trick. Why was the psychology of the worker there entirely at variance with what I have observed in factory after factory throughout the country? I soon found out why. Mr. Feiss is not only a good manufacturer but probably one of the reasons he is a good manufacturer is that he is a good psychologist. He pays his worker for doing what he wants him to do. He gives him a special inducement in dollars and cents. A girl, in order to be induced to learn another operation, is given what they call a retainer. They pay retainers not to lawyers but to girls. The retainer is in the form of a special fee in addition to all she can earn by piece work. In other words, the girls there didn't accept the opportunity for variety of work to which Mrs. Parker referred as a pleasure and inducement; they had to be paid to do it.

I can say now from practical experience that I was able to solve the problem the same way by copying Mr. Feiss' method. I found the first year, while the factory was still running in its old way, that we had the same problem. Workers absolutely refused either to change methods to which they were accustomed or to learn an additional operation. No amount of arguing that by learning an additional operation they really became more valuable, to themselves and to their employers; if they left their job and looked for another one elsewhere they had two chances to one by knowing two operations instead of one; no amount of such arguing made any impression. It mattered not. They would say, "I would rather sit idle for two months and wait for my job." And only by paying them "extra" while they are learning, can you get them to do it. We are absolutely wrong in judging the psychology of the worker from our own psychology, the intellectual worker as compared with the manual worker who has been trained always, all his life, to do simple manual work.

Concerning the remark made by a speaker about the attitude of labor in a plant in the metal industry, the opposition of labor to standardization from fear that it will interfere with earnings: the old-time craftsman who can do a complicated piece of work is probably the only worker who will object to standardization—not because of greater monotony but because of the danger to his earnings. He does not object to standardization, what he objects to is the sub-division of labor which substitutes labor of less skill for his greater skill, for the very simple economic reason that it substitutes a lower paid worker for a higher paid worker; in other words, the danger of not being able to demand the same high wage that he does at this time.

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[1] Labor Manager, Hickey-Freeman Co., Rochester, N. Y.

Otherwise you will meet no objection to standardization, because it simplifies the work. The worker welcomes any simplification of process especially when it is accompanied by a chance to earn more money.

Colonel Thompson referred to the difficulty of standardizing shoes, of reducing the variety of shoes in the factory. That, I think, has been met by the McElwain people who devote a plant to a single style of shoe, with a single kind of leather, eliminating all the variety of styles and kinds of leather and other points that go to make up a shoe. They have managed to introduce standardization to the point of perfection as near as perfection is possible in industry, and that is by specializing their plants. They are doing the very thing that Mr. Feiss referred to today when he said that standardization in the clothing industry will be possible by doing what the Joseph & Feiss factory have started to do, each plant devoting itself to a certain variety of clothing, a certain style and type of clothing. The McElwain people have done it by devoting each of their plants to one style of shoes, and I believe there lies the direction of standardization in industry.

FROM FOREIGN FRIENDS

THE following should be of interest to the members and friends of the Taylor Society. The first excerpt is from the report to his firm of a Swedish executive who spent several months in the United States studying scientific management. His report is a "treatise" on scientific management in the United States, and its development in the Swedish firm which he represents.

"It also became apparent that all the organization experts on whom I called while in New York, seemed to be more or less closely allied with the Scientific Management system. I told myself that although Scientific Management was, perhaps, the only form of industrial organization that had been systematized, there were, most likely, other systems in operation that had not been made public. But I did not know, in the first place, whether, in the near future, I should be able to discover the working of any other secret system, and I concluded, in the second place, that such a system as Scientific Management—which had made such a stir among well-informed people—must be something to reckon with. For the above reasons, and because Scientific Management was nearest to hand and tangible, I decided to capitulate before the perplexity of the situation, and give myself over to the enemy (the Taylor Society) which is the official organization of Scientific Management in the United States. My talk of capitulation and the enemy requires an explanation. The Taylor Society, described to me by several authoritative people as the principal official representative of Scientific Management, was in my black books upon my arrival in America. I had read about the Taylor-system, partly in Taylor's book "The Principles of Scientific Management" in the Swedish translation, and for the rest in various articles in technical and other publications, and my impression was that the whole thing consisted of more or less phantastic and impractical ideals or theories, to which may be added a reputation for grinding and exploitation of the workers that made it advisable to speak of Taylor and his plans in whispers, and then to a trustworthy person at a safe distance from the rest of humanity.

"I have briefly indicated my attitude of suspicion and scepticism, when one fine day I called on the Taylor Society in New York.

"It would be a long and curious story to relate how I was converted and returned to Sweden as an admirer of the Taylor System and registered member of the Taylor Society, especially in view of my feelings on the day I entered the offices of the Society.

"My reasons for considering Scientific Management (as founded by Taylor, and developed and represented by his successors) suitable for the * * * * Works, and for Sweden in general, will be stated in detail in the following pages, but before I proceed I shall give an outline of my course of study in the United States."

The second excerpt is from a report to his firm of an English executive who recently spent several months in the United States.

"After this we went to the United States Department of Commerce to make inquiries regarding the factories we wished to see, but could get no information from them. Next day we visited several machinery firms to inquire regarding the latest types—and also visited the Taylor Society (of Scientific Management) and got their introductions to the best organized and most progressive factories.

"We also record with pleasure the assistance and hospitality afforded to us by the Taylor Society and the various firms mentioned who gave us all the information desired and spared no trouble to make our visit successful."

INDUSTRIAL WASTE[1]

By **Herbert Hoover**

THE Federation of Engineering Societies has been brought about solely that we might secure for public service the collective thought and influence of 100,000 to 200,000 of our professional engineers. This great body of men in administrative and technical service penetrate every industrial avenue and thus possess a unique understanding of many of our intricate economic problems and an influence in their solution not equalled by any other part of the community. Wanting nothing from the public either individually or as a group, they are indeed in a position of disinterested service. This Federation has initiated services to the public in many directions.

I propose to deal with only one measure of this service today. Your Council has organized a preliminary survey of some of the weaknesses in our production system. This survey will attempt to visualize the nation as a single industrial organism and to examine its efficiency towards its only real objective,—the maximum production. In a general way this inquiry will bear upon the whole question of deficiency in production—industrial waste in a broad sense.

The waste in our production is measured by the unemployment, the lost time due to labor conflict, the losses in labor turnover, the failure to secure maximum production of the individual due either to misfit or lack of interest. Beyond this again is a wide area of waste in the poor coordination of great industries, the failures in transportation, coal and power supplies which re-echo daily to interrupt the steady operation of industry. There are again such other wastes due to lack of standardization, to speculation, to mismanagement, to inefficient national equipment and a hundred other causes. There is a certain proof of deficient production by comparisons of our intense results in 1918, when, with 20% of our man-power withdrawn into the army, we yet produced 20% more commodities than we are doing today. We are probably not producing more than 60 or 70 per cent of our capacity; that is, if we could synchronize all national effort to maximum production, we could produce 30 or 40 per cent more commodities and service. Our national machine is today doing worse than usual, as witness the 3,000,000 idle men walking our streets. One part of the human measure of this shortage in production is the lack of necessities or comforts to them and their families, and their anxieties as to the future.

No one will ever suppose that it is ever possible to bring national productivity up to the full 100, but the whole basis of national progress, of an increased standard of living, of better human relations, indeed of the advancement of civilization, depends upon the continuous improvement in productivity. While we currently assume that great advances in living standards are brought about by new and basic invention, yet in fact even a greater field of increasing standards lies in the steady elimination of these wastes. The primary duty of organized society is to enlarge the lives and increase the standards of living of all the people —not of any special class whatever. We are therefore proposing to make a preliminary examination of the volume of waste in certain industries, the proportions that lie in each field of fault. And no engineering report is worth the paper it is written upon without constructive suggestions in remedy.

There is ofttimes a superficial dismissal of this subject of maximum production on the assumption that there are positive limits in production due to over-supply. Such assumption has no proper foundation in the broad view of industry as whole. Too much economic thought on production has delimited its boundaries by the immediate volume of demand of a given commodity. There is no such thing as the nation over-production, if it produces the right commodities. The commodities or services produced by the whole nation are capable of absorption by the whole nation if they are of the right character. In other words, if we could attune the whole industrial machine to the highest pitch, agriculture as well as manufacture, an increasing production would mean a directly increasing standard of living. When ten men or one hundred million men divide their united output, they can by doubling their output have twice the amount to divide. The problem in doubling output is to direct it to commodities or services that they can use. There is no limit to the increase of living standards except the limitations of human strain, scientific discovery, mechanical invention and natural resources.

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[1] Abstract of an address delivered before the Executive Board of the American Engineering Council, Federated American Engineering Societies, of which Mr. Hoover is President, Syracuse, N. Y., Feb. 14, 1921.

It is true enough that any particular commodity or service can be over-produced, for each will reach a saturation point in demand when all the members of the community have been supplied. The absorption of increased productivity lies in the conversion of luxuries of today into necessities of tomorrow, and to spread those through the whole population by stimulation of habit and education. Wheat bread, railways, good roads, electricity, telephones, telegraphs, automobiles and movies were once luxuries. They are still luxuries to some parts of the population.

It is but a corollary that certain commodities can better be produced for exchange for commodities from outside our boundaries of more appropriate character to our needs. To-day we have capacity for production of some commodities not only in excess of our home need, but even beyond export demand under present financial conditions. As a matter of practical remedy, we must either reorganize these financial relations or alternately abandon some part of this kind of production and turn our idle men to making things of which we are not yet fully supplied.

To put the matter in another way, there is no limit to consumption except the total capacity to produce, provided the surplus of productive power is constantly shifted to new articles from those that have reached the saturation point of demand. For instance, we have the productive capacity wasted today that would improve the housing conditions of our entire people to the level that perhaps only fifty percent of them enjoy—and at the same time not entrench upon our established necessities. I am not suggesting that the forces of production can be shifted by imperial direction. The practical thing that can be done is to eliminate some of the wastes and misfits in our production, and depend upon the normal processes of business and human desires to absorb them.

The largest area of waste lies in the large periods of slack production and unemployment, due to the ebb and flow of economic tides between booms and slumps. The ideal would be steadily increasing production—an ideal of no likelihood of exact realization because of inability to ever gauge the advance in growth consumption or the approach of saturation. On the other hand, there are certain possibilities of stabilization worth consideration. For instance, we can classify labor into that engaged in production and service from this equipment. Our studies of industries as a whole show that we usually expand our equipment just at the periods of maximum demand for their products instead of doing our plant expansion during periods of slack consumption. We thus make double demands on labor and we doubly increase unemployment in periods of reduced consumption. That is indeed one of the factors in our great unemployment today. Everyone knows that for our normal productivity, our transportation facilities are today inadequate. We know that we are insufficiently housed, insufficiently equipped in our public roads and our public utilities; that we need an entire revision of our power supply, that we need expansion of our water ways and yet armies of idle men are walking the streets. The reasons why this occurs are not far to seek, in that it is at times of high productivity that capital is most easily obtained. It is then that the necessity of increased equipment most impresses men's minds and it is the high hopes of these periods that lead them into the adventure of expansion. Nor is it possible to expect that all industry could be so stabilized as to do its capital construction in periods of depression in commodity demand. Nevertheless, there are some industries that could, by cooperation of the government and cooperation amongst themselves, be led in this direction. More particularly does this apply to railways, telephones, telegraphs, power supplies and other public utilities, and to the expenditure upon our state, municipal and national public works.

Another variety of intermittent employment, and thus great waste, lies in certain industries now operating upon an unnecessarily wide seasonal fluctuation, as for instance the bituminous coal industry. This is today one of our worst functioning industries. Those mines operate seasonally and erratically. They proceed from gluts to famines, from profiteering to bankruptcy. As already determined by our engineering bodies, the men who mine our coal find work only seventy per cent of their time. In other words, there are thirty per cent more equipment, thirty per cent more men, attached to this industry than are necessary if it were stabilized to continuous operation. The mining engineers have already pointed out the directions in which remedy lies, through storage, through railway rate differentials and other remedies. Through constructive action, an army of men could be released from this industry of necessity to convert some luxury into a necessity of tomorrow. This is no plan to control prices or profits, although through it both the producer and consumer in coal could be placed upon a sounder basis than today. The interest of the consumer and producer, is, however, even less important than relief from the intermittent employment and unemployment within this industry that today brings a train of indefinite human misery and some of our lowest standards of living.

The second largest area of waste in productivity is the eternal amount of labor friction, strikes and lockouts. The varied social and economic forces involved in this problem need no repetition here. Fundamentally this is not alone a struggle for division of the results of production between capital and labor, but there is also a loss greater from strikes and lockouts in the element of purely human friction and loss outside the area of dispute on wages and hours. The growth of industry into large units has destroyed the old mutuality of interest between employee and employer. Our repetitive processes have tended to destroy the creative instinct and interest in employees; at times their efforts sink to low levels indeed. We will yet have to reorganize the whole employment relationship to find its solution. There is great promise in this field during the past two years, and the progress in this matter is one of the subjects under our inquiry.

Yet another variety of loss lies in the unnecessarily faulty distribution of our labor supply due to seasonal and to shifting demands. An adequate national employment service is indeed the first need to reduction of these wastes.

Probably the next largest fraction of waste in productivity lies in a too high degree of individualism in certain basic products and tools. In other words, a standardization of certain national utensils makes for economy in distribution, in operation and in repairs. The necessity of maximum production during the war opened a great vista of possibilities in this direction. Such standardization as car couplings, or wheels, and cars generally, represent real progress in this direction. These possibilities lie in a hundred directions. There are all sorts of cases from sizes of chains to the size of automobile wheels. Today dozens of different sizes are placed in the market by manufacturers and entail not only special equipment and skill to produce these many varieties, but also great stocks are required in distribution and losses are entailed due to lack of interchangeability. It is certain that there are a great many articles of every day use in which the manufacturer would indeed be glad to undertake some cooperation in standardization, from which the saving in national effort would be interpreted not into millions but into billions of dollars. This does not mean that we stamp the individuality out of manufacture or invention or decoration; it means basic sizes to common and every day things.

Another type of waste lies in our failure to advance our industrial equipment. The Super-Power Board will demonstrate the saving of 25,000,000 to 50,000,000 tons of coal annually by the electrification of our eastern power supply. The St. Lawrence Waterway Commission will demonstrate the saving of five to ten cents a bushel to the farmers of fifteen states by unlocking the lakes to ocean going vessels. Nor will this added efficiency to our national transport injure our present systems of canals and waterways, for we have ever found that the prosperity of an industry blesses them all.

Nor do we believe it is necessary to effect these things by the government. The spirit of cooperation that has been growing in our country during the last thirty years has already solved many things; it has standardized some things and is ripe for initiative toward cooperation of a wide-spread character. The leadership of our Federal government in bringing together the forces is needed. No greater field of service exists than the stimulation of such cooperation. The first stop is sane analysis of weakness and sober proposal of remedy. If the facts can be established to an intelligent people such as ours, action is certain even if it be slow. Our engineers are in unique position for this service, and it is your obligation to carry it forward.

SPRING MEETING OF THE TAYLOR SOCIETY

HOTEL STATLER, CLEVELAND, MAY 19-21

Subjects: Compensation of Salesmen; Importance to Managers of a National Index Number of Physical Production; Rating of Salaried Employees; An Unemployment Score; Cooperation of Workers in the Determination of Standards. A full day will be devoted to a visit to the Clothcraft Shops of the Joseph & Feiss Co.,—*an intensive study of scientific management technique.*

RISK AS A RETARDING FACTOR IN INDUSTRY[1]

By DAVID FRIDAY[2]

THE last four years have left me a net intellectual deposit of two major ideas. The first of these is that the science of economics needs, more than anything else, a study, thorough and detailed, of the modern industrial revolution which has occurred in western civilization during the last forty years. The other is that neither the laboring man nor the business man has any confidence in our ability as a nation to consume all that we can produce, except in time of war.

The significance of the first of these suggestions,—that we have had an industrial revolution during the last forty years,—is that it necessitates a revaluation of our traditional problems and attitude. The great mass of our economic literature was written by men whose problems were formulated and whose intellectual point of view was dominated by their industrial environment during their early years. The book of a man of sixty is dominated by the point of view of the problem of the eighties and the nineties. His remedial suggestions will inevitably be delimited by the industrial possibilities of those decades. His attitude toward taxation, toward governmental expenditures, toward what constitutes a fair return for public utilities, toward the possibility of the betterment of the common lot through means of industrial control, will all be conditioned by the productive power which inhered in the industrial society immediately preceding the two decades ended with 1899. In saying this I imply no criticism of the men of that generation; they are human. Like all human beings they were examples of the statement that arrange it as you will, the first twenty years is the longest half of life. Certainly the first thirty years is by far the greatest half of life when it comes to the formulation of intellectual and social problems. The youth who is entering college this year who has not since his grammar school days lived in a world of peace will inevitably have a different outlook and a different set of values than we who are sitting here tonight.

But the world of industry does not wait upon point of view and upon the evaluations of middle age. Since 1880 industry has been an ever-changing thing, especially on the technological side. If you would realize this, imagine yourself planning an investigation into the history of profits in which you sought to discover the extent and the causes of fluctuations in business profits. You would probably be surprised to find that in hardly any industry of first-rate importance today would it be necessary to carry the investigation much back of 1890, and certainly not beyond 1880. In such a stable business as banking, which depends for more than ninety per cent of its gross earnings upon the interest which it receives from loans and investment, you would find that the average earnings of all national banks during the eighties had been only 8.2 per cent upon capital and surplus. In the nineties it had been only 6.5 per cent. While the rate of interest is generally supposed to have fallen since that date, you would find that for the last twenty years these banks have made almost 10 per cent upon their capital and surplus. For the year 1920 the net earnings of national banks were five times their average annual earnings for the decade of the '90's. Our industrial situation today is different, both qualitatively and quantitatively. Certainly profits and the return upon capital run in quite different percentages now than during the days of the free silver agitation.

Incidentally, too, we have learned that to establish and maintain the gold standard is not to anchor the price level. Electricity, labor-saving agricultural machinery, improved transportation methods, the development of the internal combustion engine and of the automotive vehicle, the automatic tool machine, the institution of accounting in its modern sense, scientific management,—all these are products of what I have here called "the modern industrial revolution."

Fundamentally the revolution has consisted of developments on the technological side, but has had a substantial byproduct of institutional development as well. Two of these institutions we have already mentioned, accounting and scientific management. There are a number of others, among them a pretty definite set of canons as to what constitutes sound corporate management on the financial side. The gold standard as a settled feature of our monetary system; a unified banking system, centrally controlled; government control of accounting and of rates for railroads and public utilities; an enormous increase in the use of credit; a new system of federal taxes; these are a few of the changes on the institutional side which our industrial revolution has brought forth.

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[1] An address delivered at the annual meeting of the Taylor Society, New York, Dec. 4, 1920.

[2] Professor of Political Economy, University of Michigan.

From the point of view of broad economic interest the most important consequence of this development has been a great increase in our productive capacity. The reason for it is three-fold. First, we have more than doubled our equipment of productive plant. Capital has never before in the world's history accumulated at such a rate per unit of population as in the United States since the revival of business in 1897. Large amounts of it have of course been absorbed by public and private buildings and by that new means of private transportation, the automobile. But the vastly greater part of it has gone into additional productive plant, so that every worker works with more tools. It is a principle as old as Adam Smith, at least, that the productivity of the laborer will depend upon the abundance of his equipment. Second, there has been a great improvement in the type of equipment. Labor-saving machines have grown steadily in efficiency and have multiplied the possibilities of output. Third, we have had a marked improvement in the method of applying labor to the task in hand and of coordinating the productive processes and equipment Increased capital, then, improvement in mechanical methods, and improved management, are the three forces which have been mostly responsible for the increase in output which we have witnessed.

The full productive capacity which the country had thus developed was disclosed when this country entered the European War. Under the pressure of war necessities and under the stimulus of war patriotism it demonstrated its abilities in this direction by producing annually more than a dozen billion dollars' worth of output for war purposes in addition to creating all the things needed to maintain practically a normal standard of comfort among its industrial population at home. It is an unqualified testimonial to the productive power which the nation developed during the last thirty years. Without the war we should probably not have realized the power that we possessed. In 1914 the economists and the financiers alike could have demonstrated conclusively that we never could spend five billion dollars per annum upon war. Ten billion dollars would have seemed a perfectly preposterous and impossible figure. The reputation of any economist who would have suggested the possibility of fifteen billion dollars would have been blasted. Our American bankers had "talked the situation over with Sir George Paish" and had agreed that about three billion dollars was the limit; and yet we did devote fifteen billion dollars of our product to the prosecution of the war while our people still lived better than they had in 1914. This to me is the great accomplishment of America in the war, and contains an important lesson for the formulation of our future industrial policy.

If the war taught us anything that is of consequence for peace-time industry, it is that we ordinarily allow a large part of our productive capacity to run to waste through sheer idleness. Idle plant produces nothing; it encumbers the land and prevents it from being put to any other productive use. It represents labor which has been expended in its production. It represents the waiting and the postponement of consumption which is inevitably made by the capitalist once he has invested in productive plant. All the sacrifices incident to its creation and maintenance have been incurred. But its productive uses are evaporating without any tangible results by way of output. The same is true of labor. The power of the laborer to produce goods is not an economic commodity like salt or copper, which if it is not used this year may be used next; it is a commodity which must be utilized currently if at all. Idle resources, then, are wasted resources, and in what we have been pleased to call normal times a very large part of the output which these productive resources are capable of bringing forth is never realized. While it is not easy to estimate the amount of loss exactly, it is probably not less than $5,000,000,000 per annum under a price level such as we may expect to prevail in the next decade. This, be it observed, is an amount sufficient to extinguish our national debt in five years. It is sufficient to cover the entire budget of the national government, including a handsome allowance as sinking fund for the public debt.

Now that the war and the post-war boom are past, we are again at the point where we seem to be relapsing into this normal state of partial unemployment and partial production. The financial journals seem to think that there is something foreordained and predestined about this return, and that withal, it still shows that we enjoy the favor of the gods who are now about to bless us once more with the return to time-honored normalcy. But to the thinking man any such attitude is nothing better than a soporific composed of asininity and supineness. Surely in this connection it is true that "Contentment is more wicked than Red Anarchy." The war has disclosed to us in a striking and dramatic manner a reserve of productive resources of which we were unconscious. If the vaunted resourcefulness of the American business man is anything more than sounding brass he will set himself about the task of discovering how the lesson of the war may be utilized to the advancement of our national ends.

To me the situation at present, if nothing is done to improve it, seems more serious than that which would result from a mere return to the conditions prevailing in the period immediately preceding the outbreak of the European war. Business had been carried on, during the decade and a half before 1914, under a gradually increasing price level. The rise in the level of prices which began with 1897 went on steadily, until wholesale prices in 1913 stood more than 55 per cent above those of 1896. At the same time our bank deposits had increased from $5,000,000,000 to over $18,000,000,000. In such a period of ever-increasing prices for products, it was inevitable that profits should be large and that production should be stimulated. If we may believe all the predictions today, we shall see no such increase in credit facilities and no such growth in prices during the next decade. Everywhere people are expecting gradually falling prices. Can we, in the face of this situation, hope to maintain even the degree of employment of our resources and the relative volume of output which we enjoyed before the war?

There are those who insist that the movement of prices has little effect upon production, that in America at least production seems to prosper quite as well under falling as under rising prices. It may be that they are correct; that subject is one that needs immediate investigation. For the most part the people who take this position reason by analogy from the events of industry after the Civil War. To my mind that is an extremely doubtful procedure. The vastness of our unexploited agricultural and mineral resources and the inflow of immigrants who settled upon the land are two factors which are vital in explaining the growth of production in the seventies and eighties. Besides, those years witnessed an expansion of industry on the technical side such as the world had never seen before and such as we may hardly expect to see now. To say that production will continue in the face of falling prices in an industrial society where the motive to production is profits assumes either that falling prices and large profits may co-exist, or that production will be as active under small profits as under large ones. Both these propositions seem to me untenable in the absence of a rapid succession of new inventions.

The problem of maintaining productive output is by all odds the most important problem that confronts us in America today. A decline in output such as may reasonably be expected in a period of falling prices will mean declining profits, a decline in capital accumulation, and a decline in real wages. It will undo a large part of the progress which has been made in the last five years toward the realization of a truly democratic society.

Obviously, if we are to prevent this decrease in production, we must seek the cause of this retardation which characterizes industry in normal times. The war cast it out for a space of several years. If we can discover the secret of its removal during the war, we may indulge the hope of institutionalizing that secret and so increasing our national output.

What is the force which causes production to lag in ordinary times? The usual view of the matter is that business lags in normal times because of a failure of demand; that during the war and for eighteen months thereafter there was an extraordinary demand, at first from the European governments then from our own in addition and finally from an abnormal peace time demand. It was this additional demand that moved entrepreneurs to produce to full capacity. Now that the war demand has fallen off and our post-war prosperity has collapsed it seems to most people obvious that production cannot go on at its former pace. "If it did, where would we find our market?" they ask. The fundamental fallacy lurking in this analysis is a failure to realize that production creates demand in ordinary times. It is an old maxim of political economy that wants are insatiable. This is still true, even in a country where the average of productive output is as high as in our own. Not more than 10 per cent of the families of the United States have incomes of $3,000 or more. With such a situation there is still an immense amount of unsatisfied demand which depends for its appearance in the actual market upon nothing more than the opportunity to work and produce. To say that production lags because demand is not forthcoming starts with the assumption that production has already lagged and so has reduced demand. The secret of the thing must be sought elsewhere.

A more fundamental explanation is that low profits, or even ordinary profits, are not sufficient to tempt business men to high productive activity. Modern business is carried on for profit. When large profits are in prospect, therefore, production goes on at a feverish rate. It is doubtful whether this explanation of the matter is quite adequate. Most business men are perfectly willing to produce for low profits, especially when no opportunity presents itself to make high ones. The fundamental reason why production is retarded when only low profits are in sight is that a situation which yields small profits is one in which the prices of products and the prices of cost goods are close together. The risk that a fall in the former or a rise in the latter shall completely absorb the margin of profit is increased as these two sets of prices approach each other and is lessened as the margin between them widens. If the prices of the labor and material come to exceed the price of the product, the entrepreneur faces loss and ruin. During the last five years prices for products have risen at an enormous rate, and while it was certain that the price of cost goods would rise also, the margin between the two which the entrepreneur foresaw was so great as to minimize his risk. In this situation he was willing to produce to the full capacity of his plant.

The factor that prevents a full realization of our productive capacities is this risk of loss. If it could be minimized or eliminated the nation could have a high level of productive output even with smaller profits. It is pertinent, therefore, to inquire into the possibility of decreasing industrial risk through formal organization, to eliminate by institutional arrangement a burden which is now borne by the individual business man. For it is he who bears the risk as our industry is now organized. Thus far the most successful institution which has been developed for the elimination of individual risk is the institution of insurance. In essence this is a pooling of the particular risk involved. Houses burn; the building of houses would, in the absence of insurance, be a venture fraught with risk, and the supply of houses would therefore be restricted and of poorer quality. But by pooling the risk through fire insurance, one can be relieved of the risk of loss by fire for a small payment. One can then proceed to make his plans for building as though no risk of such loss existed. Cannot a similar principle be applied to the risk of industrial loss with beneficial results? If it were possible to guarantee every entrepreneur his out-of-pocket costs the risk of loss could be minimized. This would unquestionably stimulate production.

Such guaranty could be made only by the government, for it only can exercise the taxing power necessary to take from the more fortunate industries those fortuitous profits which are the obverse of the losses incident to the modern industrial process. It would not do away with the right of private property or with individual initiative, nor would it in any wise lessen the incentive to prudence and efficiency. Neither would it induce anyone to put his capital into an unwise venture. There would still be the same incentive to exercise care in the direction of production, and to attain proficiency in its prosecution, for without these no adequate rate of profit could be realized.

This would not be socialism, because the entire industrial equipment of the country would still remain private property, and the profits of industry would belong to the owner. They would, of course, be subject to taxation, and the tax system would have to be adjusted in such a manner as to take from certain enterprises the amount needed to cover the insured losses arising from the risks of modern business. Production would continue to be directed by individuals who would decide what should be made and would choose the methods of production. The right of private property in the means of production would probably have imposed upon it a new function. If the government assumed part of the risk of industrial loss it would no longer allow an owner to keep plants standing idle when such idleness caused unemployment. Any scheme of this sort would involve an examination and approval of the costs of labor and material before insuring them, otherwise the process might easily be open to fraud. But after our experiences of the last eighteen months this task certainly is not an impossible one.

The plan here set forth for maintaining the level of productive activity is not presented as a panacea, nor in the spirit of the propagandist. This nation has discovered a most important fact concerning its capacity for production. We are confronted by a serious crisis, economic and political. Fertile suggestions are therefore in order, and this proposal is presented as such. It may be that upon closer examination of the details involved in administering any such plan it will prove to be impracticable and unworkable; but if successful its possibilities are so epoch-making that it deserves thoroughgoing and unprejudiced consideration. It is presented here in the hope of stimulating frank discussion.

One thing is certain. No such plan can be put through without the extension and improvement of the principles of scientific management.

The manager is naturally interested in this means of increasing output, because its end is the same as his own, on the social side. It touches him, however, more intimately and more closely as manager. First, the program can never be carried through as long as management depends upon unemployment to maintain the efficiency of labor. If one hundred per cent employment means eighty per cent efficiency, and if ninety-five per cent employment means ninety-five per cent efficiency, then there is no possibility of increasing output through complete utilization of our labor. One hundred per cent employment and one hundred per cent efficiency must be made to travel in harness together. No realization of the ideal program here suggested is possible, therefore, without the cooperation of the manager and without the extension and perfection of scientific management.

The second point at which this problem touches the manager is a quite different one. It is impossible to carry out the best plans which management has thus far devised and to apply our knowledge of the principles of scientific management in the face of the uncertain fluctuation in demand for product and in financial conditions which characterize our industry today. If continuity of industrial process could be attained, things which are not possible today in scientific management would at once become feasible.

The proposal to underwrite production may be too bizarre to serve as anything more than a stimulus to a serious consideration of this problem of maintaining productive output. But there are several other proposals which are entirely practicable; they should be embodied at once in our administrative machinery. These are proposals looking to an improvement of our national statistics of wage payments, of stocks of goods on hand, and of production.

Since all the money that is paid in wages becomes almost immediately the active funds with which the product of the nation is purchased, a knowledge of the fluctuations in wage payments would be of great service in apprising us of our purchasing power in the hands of the people. Every employer knows what his payroll is, no matter how crude his accounts may be. I see no reason why every employer should not send his wage payments to the Bureau of Labor Statistics within five days after the close of the month. They could then be compiled and be available not later than the fifteenth day of the succeeding month.

The desirability of knowing what stocks of goods are in the hands of retailers and wholesalers is evident. One of the difficulties that has beset business during the last year and that has made its whole direction so uncertain, is the fact that most conflicting reports were abroad as to the size of stocks, both of raw materials and of finished goods.

Finally, since production is the crux of this matter, we need statistics of production actually accomplished and planned. In view of its relative importance does it not seem ludicrous that we should have an elaborate force of field men to determine the prospective output of cotton? The whole cotton crop, even in a year of high prices, is worth one and one-half billion dollars. Our manufactures have, in the last few years, totaled almost forty billion dollars in value; while the value added to the raw materials with which manufacturers worked amounted to over twenty billion dollars. And yet we have for manufacturers nothing except a census of production once in five years which is not published until two years after the time to which it applies. No figures are yet available for the manufacturing activities of 1919. In view of the importance of production for modern industrial welfare, and in view of our belief in rational direction of industry, this situation is inexcusable.

Fortunately, we have in a high official position today an engineer who is conversant with production, its problems, and its importance to the regeneration of the world. Let us hope that the vision which the engineer has shown in remaking our industrial revolution on the technical side during the last forty years will bear some fruit in the form of broad public policy looking to the realization of America's promise in the field of productive output. Grinding poverty need no longer exist in America if we show the sense in coordinating business which we have manifested in applying the discovery of science to technical problems of production.

DISCUSSION

Question from the Audience: Will not such a scheme of guarantee tend to remove, or at least interfere with the roughly automatic regulation of supply in relation to demand?

Professor Friday: It seems to me it would rather tend to equalize supply and demand. The guarantee would really amount to the carrying of stocks by the insurer, which would remove as a burden for the producer one of the principle causes of failure; or at least of shut downs; it would tend to make production and employment continuous and thereby make supply more regular. On the other hand, employment being more continuous and regular, demand would be more continuous and regular. The automatic regulation of supply and demand would be more precise than under present conditions.

I recognize, of course, that the moment we came to discuss such a scheme of practical administration as this, we should have to decide just how far we can go in underwriting those expenses. The most I suggest in this paper is that we should underwrite the producer's out-of-pocket costs for labor and material and possibly the annual depreciation charge; I certainly shouldn't go any distance at all toward guaranteeing any return upon capital. Therefore you see a producer couldn't make a cent of money on his investment unless he were efficient. He would simply have guaranteed the out-of-pocket cost, needed to keep production going; that is all. There would be all the incentive to efficiency that there is now, it seems to me, because he couldn't make any profits without efficiency.

Sanford E. Thompson[1]: I should like to ask if that wouldn't necessitate the fixing of prices by the Government?

Professor Friday: There you hit upon the real point. It seems to me that such a scheme could not be put into practice at all without at least a considerable degree of standardization. You couldn't allow *any* wages, of course, or *any* prices for material. You would have to have some standard wage, some standard price for materials, which constitute the cost on which is based the guarantee. But I for one am very willing to listen to discussion of the proposition that our whole industrial system would be very much better off with a much higher degree of standardization of product, of wages, and of prices. One difficulty with the situation today is, that these are so infernally complex. My answer to your question is, it would involve a high degree of standardization.

Henry W. Shelton[2]: I have been puzzling over one particular question and I should like to put it to Professor Friday. I am very much impressed with his proposition and it does not seem to me in its essence at all an impossible one. The only thing is the practical working out of it.

If we could imagine the technique of the accumulation and dissemination of the statistics which he proposed in his three definite propositions—the production statistics, the stock quantity and movement statistics, and the payroll distribution statistics—if we could project now the possibility of the perfection of the technique so that those statistics were gathered currently and almost immediately placed in the hands of the people of the country, would not that in itself very largely reduce the risk involved in what has been called a bizarre proposition? In other words, is not risk, as we understand it, primarily brought about by the misjudgment of facts, or the fact that we have no facts at all on which to judge? It seems to me that Professor Friday has laid the foundation for getting the right kind of facts, that it is an engineering proposition to work out how they may be collected and distributed with the utmost promptness; then as periods of time pass from one to the next, we shall be able to judge of those facts, of the trends which they indicate. It seems to me that the matter of a collective insurance for the risk involved would be a very small matter indeed.

Otto S. Beyer[3]: It seems to me the suggestions which Dr. Friday has made have been carried out in the Transportation Act under which the railroads are operating. The Transportation Act of 1920 provides that the rate structure shall be such that the railroads are able to earn five and one-half to six per cent upon a certain valuation which the Act defined.

Now, the Act further provides that this return upon investment shall be based upon efficient operation. It does not, however, state how this efficient operation shall be brought about. What I would like to ask Dr. Friday is whether or not in a rough way this corresponds to the suggestion which he has made? It still remains to be proven that under this particular arrangement we shall get efficient operation. The recent figures seem to reveal that our railroads are not necessarily bringing that particular return which is going to equal five and one-half to six per cent.

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[1] The Thompson & Lichtner Co., Consulting Engineers, Boston and New York.

[2] Consulting Engineer, Philadelphia.

[3] Consulting Engineer, New York.

Another provision of the Transportation Act, I might add, stipulates that all earnings over and above five and one-half to six per cent shall revert to the industry for the rehabilitation of properties, etc. The general idea seems, as I see it, to comply somewhat with your suggestion.

Professor Friday: That is analogous, but I wouldn't go so far as to guarantee return on the investment. Public transportation is such an important interest that we must see to it that it goes on. It is, however, an analogous proposition.

Sanford E. Thompson: To give a different turn to the discussion and perhaps more than anything else to get an answer from Dr. Friday, I should say the proposition seems to me absolutely impracticable.

Take, for example, the present situation. I asked a minute ago about prices. In the rubber industry the bottom has absolutely fallen out and yet for about a couple of months after the bottom fell out the larger manufacturers maintained full list prices. They have cut prices now about fifteen per cent. Crude rubber at the same time has gone down to half of what it was. If the large concerns are going to work with prices in that way, if they are going to maintain prices and merely cut a little bit when they cannot expect to sell goods unless they make big slashing cuts which correspond to business conditions, how are we going to balance out the conditions so as to give any fair insurance?

Another point I would like to bring out has already been brought up, but it doesn't seem to me it has been answered. That is the difference in efficiency of different plants. We have some plants that are making a great deal of money and other plants are making none at all under the same business conditions. We may say that we should have scientific management, but it takes in most plants several years to introduce scientific management so as to get the real basic returns which mean the real reduction in costs and the big increase in output. How are we going to arrange some of those things?

Professor Friday: With respect to the differences in efficiency, I don't think that raises any problem. I am not proposing to guarantee anybody a return upon his capital. It seems to me that inefficient plants would be eliminated just as certainly under any such scheme of insurance of out-of-pocket cost as under present conditions, except that they would not be eliminated by short-time, temporary, accidental factors. I believe today that a considerable number of pretty solid businesses are forced into difficulty and oftentimes into bankruptcy, that men suffer financial extinction, have their business careers brought to an end, by conditions which are temporary.

Nothing can save the inefficient plant, and if one doesn't guarantee a return upon investment, it seems to me the inefficient plant is bound to be eliminated by that very fact. Investors will not put any more capital into it. They will take out the capital they have in it, insofar as they can get it out, and transfer it to some other industry. There is an important distinction between the kinds of cost that you are going to guarantee. I am proposing to guarantee the out-of-pocket cost for labor and material. That is one thing.

We might go one step further and guarantee also the depreciation of the capital; possibly a further step and guarantee interest. Ordinarily the economist who talks about the cost which determines price, the cost of production, includes all of these elements in cost.

Now there is an important qualitative difference between those three elements of cost; I should begin with simply out-of-pocket costs. I wouldn't even guarantee capital investment. If a man puts his capital into an industry and then runs it so inefficiently that he cannot make a return on that capital he will have to lose it, and suffer the pain of inefficiency. But for the time being he would be under no necessity of laying off his labor and stopping production.

I think it is a great shame to close up the copper mines. As far as I can discover, all but a very few of the copper mines are being closed up. Stocks of four or five hundred million pounds are lying idle and those people in upper Michigan are going to be idle. I don't believe that is necessary. I believe it would be much better for everybody concerned if some means were devised by which that production could be kept going, and all it would involve of course would be the out-of-pocket cost for labor and material consumed. The Government could take the risk of that, covering it by taxes from other industries, and it would keep that copper production going. The world certainly is going to need copper. We consumed 1, 200,000 pounds in the United States before the war. This is a mere temporary situation. It is very doubtful wisdom to my mind to stop production simply because there is some temporary situation which makes it impossible to sell that copper at a profit. But I wouldn't go any further than out-of-pocket cost.

From the Audience: Isn't there an analogy in fire and other insurance? If a building is a very poor fire risk the insurance company will either refuse to insure that building or will charge an enormous premium; but if the owner will add an extra protection, certain safeguards against fire, his premium is reduced. The service is a stimulus to providing safer buildings. When accident compensation insurance was first introduced it fell indiscriminately upon the entire industry. But very soon manufacturers discovered that by increasing the safety element in their buildings, by providing protection to their employees against danger from machinery, by having fire escapes and other things, they were able to get a reduction of their premiums. That is operating every day. The plant manager knows that, and in this way insurance has decreased carelessness. It has stimulated the tendency to greater efficiency and greater safety.

While upon first thought it might seem that a scheme like that proposed by Professor Friday would lead to recklessness in business, because everybody would feel he is insured against loss, the limitations that would be placed upon the practical application, by insuring a man only for out-of-pocket cost and by premiums varying in accordance with efficiency in management, would make for better management.

As in the case of fire insurance the Government would have a right to reject any application for insurance if the enterprise was on its face an unsatisfactory one, an unwise venture.

I imagine it would have to provide that if the enterprise is manifestly a superfluous one, that there is more than a safe number of plants in the country supplying the given commodity, the Government would refuse to underwrite such risk, and probably with the necessary statistics at hand, which of course is an absolute prerequisite, there would be greater intelligence of what the risks are and by that very fact reduce risks to the minimum and make the thing practicable.

From the Audience: I had read Professor Friday's book "Profits, Wages and Prices," before I came here, and I have been very much interested in the additions he has given us to the contribution in his book. I have thought, both in connection with his book and his contribution here tonight, of two things that are seeming to come to the front to such an extent these days,—regularization of industry and industry for service.

It seems to me when the implications of those terms begin to be understood more, not only as a matter of an ideal but as a matter of technique, that one of the first instruments of approach to it will be through some such means as Professor Friday has suggested.

In connection with the various remarks that have been made, I was struck by the fact that right here we have had an illustration of our lack of comprehension of the implications of it.

In connection with this matter of the railroads; the inherent nature of the railroads as a business, involving problems that are not ordinarily involved in what we think of as competitive business,—we have been all through our history going on the fallacious assumption that railroads are inherently competitive rather than inherently monopolistic.

In connection with the gentleman's remark regarding the fixing of prices and the refusal of producers to cut prices and keep busy; when a large scale business becomes a dominating factor in the market of any particular product it takes on the same aspects that the railroads do, it becomes inherently monopolistic.

The query came to my mind as I thought of it, why would the Government necessarily have to take so much more of a hand in this than it would, say, in connection with the protection against accidents under workmen's compensation? If you want to build a state fund for the particular parties concerned in protecting themselves against risk, they buy their protection against it with a certain premium. Of course, in order to establish any premiums we are involved in having the statistics Professor Friday suggested.

And as we get into the thing more and more I am convinced that it would mean an entirely different ambition concerning our national production than we have under the present organization of industry; and what experience I have had in the business world has led me to think that it is almost impossible for the business man, as a rule, to try to visualize another situation as large and complex as this would be on the basis of a national scheme dealing with industry.

So it seems to me there would have to be a program of education accompanying such a scheme.

Suppose we could get the Congress to be perfectly willing to establish a commission that would give us the necessary statistics; would we have the mental attitudes on the part of the business world such as to sanction such a move? And then in connection with the ordinary reaction in the way of providing jobs, are we paying the penalty there of the philosophy that the best government is the least governing. So there would be a number of things that drive in at first hand approach to the feasibility of the working out of such a scheme as this.

I don't mean to imply from this that I think it is hopeless. It struck me, as I have tried to give the best consideration I could to Professor Friday's work, that it has been one of the biggest approaches to healing the fundamentals of economic life that I have any cognizance of in the last fifty years.

Dr. N. I. Stone[1]: I think Professor Friday is quite correct in stating that nothing particularly useful comes out of the quinquennial census. That is extremely poorly done; is prolific with mistakes. That is probably the chief feature of our statistics of manufactures as we get them every five years.

About four years ago some of us who were engaged in government work in Washington tried to arouse the interest of those concerned in production statistics. Our commercial statistics are only one degree better than the industrial statistics. As regards our foreign commerce we have monthly statistics of exports and imports. For domestic commerce, we have just a sort of embryonic beginning so far as the Interstate Commerce Commission publishes them. There was a small division in the Bureau of Statistics of the Department of Commerce conducted by one man who tried to get something out of the traffic reports to build up statistics of domestic commerce and that died a premature death after struggling for a few years.

We had an interdepartmental committee created of representatives of the Treasury and Commerce departments that struggled with the subject for two or three years and made some constructive suggestions in a report submitted to the heads of the departments. It died a peaceful death in 1912 at the time of the change of administration, and nothing has been heard since except that recently the Chamber of Commerce of the United States approved a new method of classification of our statistics of imports which may be perhaps a little more scientific than what we have had. Really, there has been no beginning, except that feeble voice that we raised in Washington eight years ago.

We had a joint committee of the American Economic Association and American Statistical Association and some of us advocated a special commission to be created by the President with a sufficient appropriation from Congress to work out a comprehensive scheme of statistics covering the entire industrial and commercial field. Some of us felt that we shall never have decent statistics until we have some such commission, because our statistics in Washington just "growed like Topsy." Here and there a bureau is created, somebody has an idea or some special need for the creation of a bureau, but there is duplication and groping and we haven't an organized comprehensive scheme of statistics covering our national economy such as a well-organized corporation has to account for its business. In other words, we have no national bookkeeping worthy of the name, and it would be a very happy thing indeed if the Taylor Society were to show an interest in the subject and if we could get what we have vainly tried to get; if we could enlist the interest of the engineering societies, of the business organizations and even of the labor organizations to start a real national movement of all the producing elements to urge upon Congress the seriousness and importance of this problem.

While I am on my feet I should like to say that the brilliance of Professor Friday's suggestion of having a national insurance of industrial risk is exceeded only by the importance of his suggestion for better statistics of production as the first foundation stone that would have to be laid, for without such a foundation no scheme of the gigantic proportions he suggests would be conceivable any more than life insurance without the actuaries' data. We need the actuarial statistics of business.

We do have some statistics of production which are got out by private effort. We have organizations like Dun's and Bradstreet's which give us some statistics of the mortality of business enterprise—probably the best statistics we have of risks in industrial business. That is probably the most solid contribution that is made; yet it is wholly due to private initiative, and while a very good piece of work it can't be as absolutely comprehensive and reliable as government statistics would be. Then we have the statistics secured by various commercial bodies which again are only illustrative, each being rather indicative of the volume of business but not comprehensive or exhaustive.

Professor Friday's suggestion as to monthly statistics I think is a very valuable and a very important one. I think when we get going in this field we certainly ought to have monthly statistics. You may be interested to know that the State of New York made a very feeble beginning back in 1913 or 1914, when we had unemployment to a very appalling extent in this city and elsewhere. Some of us were interested in this problem of unemployment and got the Bureau of Labor Statistics interested, and since then it has been publishing a very simple and yet very interesting and instructive set of figures. They are very easy to get at, and at very small expense. Some of you may know the monthly labor market bulletin published by the Bureau of Statistics at Albany. That contains just two sets of figures; total amount of payroll, total number of employees and a curve indicating each. That is published monthly and the cumulative figure, the total curve that has been built up for the last fifty or sixty months, is very instructive. Outside of that I don't know of anything worth while.

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[1] Labor Manager, Hickey-Freeman Company, Rochester, New York.

Morris L. Cooke[1]: The suggestion of Professor Friday's that taps my imagination more than any other was the one with regard to inventory statistics. It seems to me that a nation that shuts down in order to take stock is not in position to provide inventories monthly.

Now I have a very simple suggestion that I think may turn the trick. During the war, during the time when the railroads were staggering under their heaviest load, a very ingenious suggestion was made by Mr. Titsworth of the Storage Committee, and worked over by his associates, providing that every manufacturer should, the moment he booked an order, book it by volume and weight in addition to money. Every manufacturer books his orders by money. Why? Because periodically he has to put his little book under his arm and go down to the bank and show them what he has in the way of orders, to get some money. It is a great deal easier to book orders by volume and weight. The thought was; we could start in a center like Indianapolis and have every manufacturer in that district send in to the Government once a week—oftener if necessary—a list of the volume and weight of all orders on hand with the prospective delivery day. I won't follow this out, but with your own imagination you can put those data on Hollerith cards—information as to volume, weights, kinds of goods, destinations, delivery dates, and so on—and have something to assist the railroads to route their freight better and determine the probable requirements of cars and other service.

If it is ever done for the railroads it seems to me it will give in very simple form just the data that Professor Friday requires.

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[1] Consulting Engineer, Philadelphia.

ENGINEERING vs. HUNCH

THE past ten years have seen a remarkable advance in the application of business research and statistics. Whereas business men once depended to a considerable extent upon a tradition of personal genius in business, the modern tendency is more impersonal, more statistical and more departmental.

Disillusionment about mystically successful business men came some years ago when in notable instances the makers of millions were found to be so powerful not because of their marvelous individual business genius, but because of secret rebates, political intrigue, child labor exploitation, monopolistic advantage and other methods now outlawed legally and morally. Efficiency and technical thoroughness thereafter gained ascendency, and these demanded the application of more of engineering exactness to business method; depended less upon privilege, graft and intrigue and more upon analytical ability, preparation, delicate adjustment and detailed knowledge. Thus was the way cleared and the secure place made in business for commercial research and statistics. Quite true, the rapid advancement of research in other lines, in chemistry, metallurgy and electricity, for instance, influenced business men, for it was not a difficult gap to bridge in their minds between appreciation of success in factory research and research in sales and administrative problems.

Information, consensus of opinion, comparison, fact and figure about business matters are now in a very fair way to be recognized as commodities quite as tangible in value and importance as wood and iron or steel. Policies and plans must be built upon a foundation of fact before they can be regarded as sound or businesslike; therefore the business of fact-getting, fact-weighing and fact-comparison is of quite primary importance in business, and must become increasingly more so as the men who operate buiness increase their respect for facts and seek them as underpinning for more and more of their business judgments. (J. George Frederick in *Business Research and Statistics*, p. vi.)

DAILY PROBLEMS OF THE ORGANIZER[1]

By KEPPELE HALL[2]

A GOOD many years ago, I obtained a degree of Electrical Engineer from the School of Electrical Engineering of Princeton University. In those days that course was a two years' course, presided over by the doctor and scholar, Doctor Brackett, who is one of the most learned and wise men that it has been my privilege to know. The course was an exceedingly difficult one, and there was no snap to it. Our textbooks were largely in French and German, and we got into higher mathematics so high that you couldn't see over the top. When we did get through, and there were about eight of us out of some forty or fifty, we felt that we were pretty hot stuff, and that when we stepped out, the arms of the world would be just aching for us, and that anything that we wanted would be ours. Dr. Brackett called us together with him for a talk before we received our diplomas. "Well, boys, you are through with this work, and if you are satisfied with what you have gotten out of this thing, I am satisfied; but there are two things that I hope you have learned, and if you have learned those two things, I shall feel that your time and my time have been well spent. The first thing is, I hope you have learned that you do not know a thing. The second—that when you get up against a problem which has to be solved, I hope that you have learned the way to go about to solve that problem."

Now when we first heard that, it was a sort of a blow because we thought that we did know a lot. But the longer I live, the more I appreciate how little I know, and the more grateful I am that I have had the opportunity to have the foundation which would permit me to work out problems that had to be worked out, and build on it the structure that had to be built. In starting my talk with a remark of that kind today, I am not saying it with the idea of discouraging you with the work you are about to take up, but simply to let you know that the experience that we have when we get out and commence to apply the things which we have been studying, we are bound to run into all sorts of oppositions that, if we were not prepared for them, would be discouraging.

Now let me outline to you the kind of difficulties that we run into when we go out and attempt organization work. It does not matter whether it is the organization of an office, or the organization of a factory, or what kind of organization it is,—whether it is followed up by efforts to increase production of some kind or another or not, you will always run into a certain set of difficulties, and the first of these, I think I would call a purely mechanical difficulty. It is a very difficult thing in itself to go in and physically make some change in an existing organization, even if everything else is favorable and satisfactory—if the people for whom you are working tell you the world is yours, —go ahead and do what you please,—and even if you go out with an excellent training in the technique of what you want to do,—when you come to actually apply that technique, you are going to find out what a hard thing it is to do of itself.

I had an experience of that kind in a leather factory some years ago. This matter of organization had to do primarily with manufacturing, but when I am talking of manufacturing, you may apply the same thing to office organization. Everybody was perfectly willing for us to come in and do whatever we pleased. I had some training in Philadelphia at the Tabor Manufacturing Company, and had gone through all of the minutia of the technique. I had seen how easily this worked out at the Tabor Manufacturing Company, and thought it would be very simple for us—simply to outline the organization with the definite functions of the different people, have clear planning, good routing of work, give out time tickets, and issue material. In this leather shop, we were told to go ahead and do it. Now, the thing didn't work. I was a little green at it, but I thought I could do it. I thought it was easy from the things I had observed, and that it was the easiest thing in the world to do in this leather factory.

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[1] Address delivered before the students of the Wharton School, University of Pennsylvania.

[2] Superintendent of Planning, Joseph & Feiss Co., Cleveland.

I had lost sight of the fact that what I had seen work was the result of the daily experience of years of hard work. When I started out with my route sheets, and time tickets, the workmen did not pay any attention to the time tickets and the clerk did not properly check up the route sheets. In less than no time I found an accumulation of incorrect sheets, misused blanks, and the whole thing in an awful mess, and I had to start and dig in and smooth the thing out again. This was the result of my lack of practical experience. I should have had this fundamental instruction which I did have backed up by some practical experience in working with some men who had been through this game, and knew it. Until we get that sort of experience, we are never going to be able to get things through without always running into mechanical difficulties.

I am talking largely about factory work. If I illustrate with the experiences I have had from the factory, please understand that the same sort of thing applies in any kind of organization work.

One of the first difficulties will be from the fellow doing the work in any organization in which you go. With your eyes that have been trained by the theoretical and technical experience that you are getting here, you will see the weaknesses of any organization into which you go, but you will also find, on the part of the people you are dealing with, a perfectly natural and instinctive opposition to doing anything new,—and that is to be clearly understood from the start. It is not an unnatural thing. Because you have a very much better way of doing something than some other fellow is no assurance that the other fellow is going to welcome it. Later on,—perhaps after he has had a chance to try it out, and see for himself that your way is a better way than his, will he be glad to do it. It is perfectly natural and instinctive for any man to oppose something new.

I had an experience in a paper mill, where we had made some very intense studies of the best way of arranging or organizing the work of trimming some paper,—a very simple operation. Our study led us to believe that the man who was operating the trimming machine could turn out on an average twice as much work as he had been turning out with no more expenditure of effort,—or with practically less expenditure of effort—than he had been employing on the work as he was doing it. But do you suppose that this meant the minute we told him this, that he did it our way? Not at all. The thing was, "What do you know about trimming paper? I have been running this trimming machine for fifteen years. Did you ever run a trimming machine?"

"No, I didn't."

"How are you going to show me how to trim paper?" I had to go on and explain to him how we had studied this, and we knew that we were right about it.

"Well, that is all right, but I trimmed paper before you were born, and now you are coming around here to show me how to do it."

It's a perfectly natural thing. That fellow was taking a pride in his work, and was doing his job successfully, and he could not see how we were going to offer him any advantage. We could not say to him, "Now, it has got to be done this way," but we had to be very patient and tactful, and little by little, as opportunity offered, show him how our way was better than his way, and incidentally accompanied by an increased earning in case he did it in the way in which we outlined. Presently one of the fellows tried it out our way and found it worked, and then the thing became comparatively easy. We had to get over that stage with the man who was actually doing the work himself.

Another form of opposition that you will encounter is from the men above the fellow who is actually doing the work,—the foreman or the superintendent or the man in charge. You are going to find that that opposition is greater than the opposition from the worker. This man is a man who has had more education than the fellow who is doing the work. This is the man who has probably outlined to the man under him how he was to do the work. If, in an office, this man himself planned the present form of organization, and you are treading on his toes when you try to do a thing of that kind, he wants to know what is to become of him. Let me illustrate that to you by a practical experience which I had. This also was in a paper mill, but a different mill from the other I mentioned, and was a different problem,—that of calendering paper. Our study of that process led us to find that, with very little change in the arrangement of paper as it was brought to this machine and the speed with which the machine could be run, very much more work could be turned out in a given time than had been done before. Now you must be absolutely sure that you are right in any of this work before you make any statement. The eyes of everybody are riveted on you, and are looking for the least little defect, and if you make an assertion and cannot back it up, everybody is going to know about it.

In this mill, the superintendent was the highest paid person in it, and was said to be the highest paid superintendent in the country, and was deriving the high salary because the management of that company said he was the best man in the United States, and that they couldn't run their business without him. That was a terrible indictment for that company! That concern was in a rather dangerous condition. No method of organization of management can afford that sort of thing. Before we had made a suggestion as to what we were going to do, we absolutely demonstrated to our own satisfaction that what we said, could be done. We were going to have opposition from this superintendent, who had been all the time opposing the thing that we had been suggesting. I went to the manager again, and told him what we wanted to do, the work we had done, and the conclusions we arrived at, and what was to be expected. The general manager suggested calling the superintendent in right away. Since the superintendent was familiar with the experiments we had been making, I was glad to have him called into the room. I had been in this establishment possibly eight months, and it was only the second paper mill that I had been in. The general manager of the company said to the superintendent,—"Now these people have made some studies on calendering paper, and beginning next Monday morning, they are going to start," (and so on, etc. ,etc.) I will never forget what happened! Up got this high-priced superintendent—and he had a violent temper, too,—and he walked up and down the room—and said to the general manager of the company,—"All right. If that is what you want to do, do it, but I wash my hands of what happens to your plant. If you want to take the opinion of this 'boy' who has never been in a paper mill until he came here, against mine,—go ahead and do it. It is up to you."

The general manager was sort of up against it, but told us to go ahead and do it. Then the superintendent said, "What are you paying my salary for? This thing he says can be done *cannot* be done and I will stake my reputation or my life on that fact."

When the general manager of the company was put up against that sort of proposition, it made me wonder about "this boy," and how about this $25,000 person. And it was right then and there that the general manager showed his spunk, and simply said to the superintendent, "I am sorry you don't agree with him, but it is going to be tried out." If we had not been absolutely sure of what we were going to do, beforehand, —what a monkey the "boy" would have looked like! That kind of opposition is bitter. You are going to run into it, and the people who take you by both hands when you come, and say "I am so glad to see you, and you are giving me just the thing I have been wanting," etc., etc.,—and when you get there and commence to tread on their toes—which you will have to do—they are going to turn and bite you.

The next difficulty that you are going to encounter comes from the top itself. What I have told you about the opposition from the worker and the mechanical difficulties of doing what you want to do, the opposition that you are going to get from the foreman and superintendent fade into insignificance when you encounter the man who sent for you to save the plant or his life or the world,—who told that you were just the man he wanted to do this job for him —he is the man that before you get through with what you want to do, is going to have misgivings. He is going to see how much money this will cost, and whether he is doing the wisest thing, and he is going to find this sub-official and that sub-official and superintendent and foreman, and the people in that class— and the heads of the departments—they are going to say that this won't do. And the $25,000 superintendent is going to say it. Some other foreman is going to say it. And the cumulative effect of that on the man at the top is something that you are going to have to encounter, and face, and is the hardest thing of all because the man at the top is the man who finally says "yes" or "no"; he is the man who has the final say as to whether or not you are going to stay, and whether what you want to do is going to be done or not. This will outline the character of the difficulties that you are going to encounter in your work. I think that what I have said so far is sufficient to indicate the kind of opposition that you are going to have.

How are you going to overcome it? In the first place, you go out as engineers in organization or management work, and you have got to be people of absolute honesty and integrity. I don't care how much you may learn,—I don't care much how wide your experience has been, unless you can go into an establishment with a knowledge on the part of the people you are working with, that you are absolutely honest and that you are of unimpeachable integrity, you sooner or later are going to get into trouble. This is the only foundation on which this whole engineering profession must be based, if it is to successfully fulfill the obligations that have been placed upon it by society. There must not be the faintest whisper that what you are about to do is for the exploitation of somebody. There must not be a question of the means of incentive that perhaps this fellow has some motive for doing this thing that is going to give one fellow an advantage over the other. You can't do it! You must play the game clean. Lay your cards on the table. Look every man in the eye with the consciousness that you are doing the right thing. I cannot emphasize that too much.

Now there are certain qualifications, in addition to these, that are very essential. In the first place, you must have knowledge of what you are trying to do. You cannot go in and carry out this work on the basis of bluff. You can do that sometimes with things of little importance, but you cannot do it on the things that are worth while. You had better admit that you are sorry you do not know, and don't be ashamed of doing it. Know what you are talking about.

You must have a large quantity of three qualities. They merge into each other so closely that in my notes I put a bracket around them. They are:

(1) Perseverance
(2) Patience
(3) Consideration

You cannot give up when things begin to go wrong. You must persevere. And things are bound to go wrong. The things that we accomplish in this life without things going wrong are not the things that amount to very much. We must be unwavering in our perseverance. Next, you must be patient. This kind of work will try your patience as nothing else that I know of. People appear to be awfully stupid. You cannot understand why they are so dumb. You have the inclination to put on your hat and go out! And the thing that will make you patient is the third thing—your "consideration" for other people. That word "consideration" means a great deal. You must be considerate,—you must sympathize to a large extent with the other fellow's point of view. You should fully understand why it is that he feels the way he does, and says the things that he does, and you must be very considerate of him.

And then, you must have vision. God help you if you cannot look ahead when things are sort of black. You've got to be sort of an idealist. By "idealist" I don't mean a wish-washy sloppy fellow, but I mean a fellow who fixes his sight on something high, ennobling, and good,—who is not going to let anything that happens dim that vision, and who is going to press on to it in spite of anything that happens.

Then, with your vision, put into your work two things,—common-sense and decency. I am interested in scientific management and have been for a number of years. I read a good many definitions of scientific management; I have given a good many definitions of scientific management, studying into things and trying to find out scientifically what the right thing to do is, and what is the right type of organization to have, —and then making everything tie up. This is the object of modern management, or any one of the terms that you hear applied to it. But I have found that if I can keep in the back of my mind these two things, that I have got to have some common-sense, and I've got to be decent,—that I come pretty near being everything that could be included in the term,—"scientific management."

There is a lot of foolishness and a lot of bunk. The late Frederick W. Taylor used to say,—"I haven't invented anything new. I haven't a system, I haven't a panacea for all of the ills of society or an industrial organization, but all I have is what I have taken from other people, and organized and applied some principles of common-sense to,—and that is all it is."

All these things I have been pointing out to you are to guard you against losing sight of that thing that you've got to hang on to—common-sense.

And decency means giving everybody that you come in contact with a square deal, and if you have these underlying qualities that I spoke of at the outset,—honesty and absolute integrity,—you will be able to be decent with the people with whom you come in contact.

I wish I could give you a picture of the sort of things that you run into every day in industry. I wish I could give to you a picture of the crying demand of industry for men who have the training that you are getting right here. There is a terrific responsibility connected with this,—a responsibility so great that it should frighten you every time you stop to think of it. Here is a group of young men who are being trained with the idea of becoming leaders,—who step out in this confusion that the world finds itself in today, and show people the way out. It is a terribly hard thing to do, and we have to keep in our minds this responsibility that we owe to society, and we have trained ourselves and drilled ourselves, so that we can step out in this field, and take the position for which we are fitting ourselves. It is a very serious thing.

The problems that confront the engineering profession today in this country or in the world are tremendous. Those who will solve them are honest people with this kind of training, people in engineering and allied lines, students of economics, students of philosophy, the people really doing the thinking and the planning. These people have a tremendous function to fulfill in the world today. I hope that you will all have in your minds in whatever you undertake, this feeling of your own responsibility, and the feeling that it is your solemn obligation to fit yourself to be a man and to be a man who can stand as a leader of men.

In conclusion, I just want to bring these things to you. In this kind of work, you are bound to deal with a lot of intangible things, and because things are intangible, don't think that they are not real. I think that some of the realest things that we have to encounter are the things that are intangible. What are you dealing with when you go out and take up methods of organization? You are dealing with human beings themselves. What do human beings do? They eat, work, sleep, and they think,—and what they think means just as much as what they work (which you can see), and what they eat (which you can see) and what they sleep (which you can watch) and it is what they think. The thought is the thing that must be at the bottom of every action, because you have to think out something before it can be done. You have to deal not only with people's thoughts, but you have to deal with people's aspirations. You cannot see people's aspirations. It is something inside of a man that is no less a real thing because you can't see it, and makes him aim for something more and something better. You have to deal with them when you are dealing with people.

You deal with people's imaginations. Someone has said that "without vision people perish." Without imagination, there is no building up of some sort of mental image that becomes a real thing to them.

Just carry away that message, if you will. In the first place, be prepared for all sorts of difficulties, but don't be daunted by them. Fit yourself, so that you can tackle any problem that comes, and do it; have some common-sense; be decent; and never lose sight of the fact of your great responsibility and the service that you are rendering your fellow-man.

EXTRACTS FROM REPORT OF A CONFERENCE OF EMPLOYERS
CHIEFLY MEMBERS OF THE SOCIETY OF FRIENDS
SUBMITTED TO LONDON YEARLY MEETING, 1918

I. WAGES

WE believe that the following propositions may be laid down with regard to wages:—

10.—(1) In determining the rate of wage to be paid, a distinction must be drawn between the minimum or Basic Wage and wages above the minimum, which may be referred to as a Secondary Remuneration. The former should be determined primarily by human needs; the latter by the value of the service rendered.

1. *The Basic Wage*

(a) Men.

11.—The wages paid to a man of average industry and capacity should at least enable him to marry, to live in a decent house, and to provide the necessaries of physical efficiency for a normal family, while allowing a reasonable margin for contingencies and recreation.

(b) Women.

12.—The Basic Wage for an adult woman of average industry and capacity should be the sum necessary to maintain her in a decent dwelling and in a state of full physical efficiency, and to allow a reasonable margin for contingencies and recreation.

2. *Secondary Remuneration*

13.—The Secondary Remuneration is remuneration due to any special gift or qualification necessary for the performance of a particular function, e.g., special skill as a tradesman; the special strength of some physical organ, as in the case of a gas stoker; special muscular training and power, such as that of a lumberman; responsibility for human life, as in the case of locomotive engine drivers.

14.—We believe that if once the Basic Wage is fixed at a right level, the precise amount of this secondary remuneration to be paid for different services may be left, as at present, to bargaining. But in conducting such bargaining the employer should remember that the pleasures and varieties of life are just as dear to the workers as to himself, and that they, too, need comfort, rest, and change of scene.

II. STATUS

19.—The worker asks today for more than an improvement in his economic position. He claims from employers and managers the clear recognition of his rights as a person. The justice of this claim our religion compels us to admit. We cannot regard human beings as if they were merely so many units of brain power, so many of nervous or muscular energy. We must cooperate with them, and treat them as we ourselves should wish to be treated.

23.—The management of a business may be divided broadly under three heads:—

(a) *Financial.* The provision of Capital and appropriation of Profit; Relations with Shareholders, Bankers, Competing Businesses, the State, Terms of Credit, etc.

(b) *Commercial.* Determination of the general character of the goods to be manufactured or of the class of work to be undertaken; Purchase of Materials; Sales of Product; Advertising.

(c) *Industrial.* Control of processes and machinery; Nature of product; Engagement and dismissal of Employees; Hours of Work; Rates of Pay, Bonuses, etc.; Welfare Work; Shop Discipline; Relations with Trade Unions.

24.—With the financial and commercial aspects of the business and the general policy connected therewith the worker is not at present so directly concerned, although indirectly they affect him vitally. But in the industrial policy of the business he is directly and continuously interested, and he is capable of helping to determine it. How can we give him an opportunity of doing this?

25.—As an initial step, any existing Shop Committees, such as that of the Shop Stewards in engineering works, should be formally recognized. But, in the absence of such bodies, we recommend the establishment of Committes or Works Councils, in which the chosen representatives of the workers should discuss matters which concern them, first alone, but secondly, and at frequent intervals, with the management. In this connection it would be essential to secure the cooperation of Trade Unions and to make it certain that their positions would not be prejudiced by the existence of such Councils.

26.—To these Councils might be referred questions affecting the individual works, such as wages, rates, discipline and shop rules, the engagement and dismissal of workers, the time and duration of factory holidays, adjustment of working hours and number of staff to meet shortage of work, health, canteen, and other social work. It is fully realized that experience on Works Councils may and should train the members for greater participation in the control of the business, and enable them ultimately to take part in the commercial and financial administration.

27.—Questions affecting the whole of an industry are not capable of settlement by Councils representing single firms; but the same principle of consultation and cooperation can be applied to their settlement through the National and District Industrial Councils recommended by the Whitley Report. Where therefore the nature and organization of the industry make it possible, employers should do what they can to initiate and assist in the establishment and working of such Councils.

28.—When industry, now being conducted by methods hurriedly devised to meet abnormal exigencies, is re-established on a permanent peace footing, conditions will be widely different from those existing before the War. It is of the utmost importance that employers and workers should cooperate, frankly and cordially, in determining the new conditions. The application to individual firms of general principles agreed upon by the Trade Unions and Employers might very suitably be discussed in the Works Councils referred to above.

III. SECURITY OF EMPLOYMENT

32.—(1) The business should be carefully organized

(a) With a view to reducing the employment of casual labour to the lowest limit; and

(b) To regularizing work throughout the year so far as possible.